THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

An expectation of lower prices is abroad in the iron trade to an extent that prevents any large buying covering a period of months. Yet the amount of inquiry coming up week by week indicates that consumption is not lessening, and that buyers are keeping close track of conditions, so that they may not fail of needed materials. The reductions in several finished lines have affected the pig iron market, bringing prices to a more conservative basis and putting an end to any lingering boom feeling. Railroads have gained ground, also, in their attack upon the freight embargo, and furnaces in the Central West note a marked improvement in the coke situation. If this should be kept up, aided by the release of cars that have been hurrying coal to lower lake ports for the last trips up, there will be pig iron enough to go around, and every month in the new year will add to the active furnace capacity. While the ideas of sellers of foundry iron as to the proper prices for the second half of 1903 have been revised somewhat, there is little interest in such sales, and the prospect is for a hand-to-mouth market for the next few months. Meanwhile foundry iron for the first quarter and first half of 1903 can be bought 50 cents to $1 lower than was possible a few weeks ago. In the South an important development is a movement to consolidate some of the isolated furnaces in the eastern part of Alabama, with a view to strengthening them in raw materials. The Central West, including the Pittsburg district, shows a waiting pig iron market, with no expectation of an early resumption of heavy buying. Steel maintains its firmness in the face of light buying, and Bessemer billets have sold at $29 to $29.25 at Central Western mill. The import movement is lighter with no change in prices. Statistics for October show that the total imports of pig iron, steel and iron and steel products in that month was lighter than in September, while iron and steel exports showed an increase over September—a significant turn in the foreign trade that will be worth watching. Rails have been the most active department of the market of late and it is estimated that 200,000 tons have been sold in the past fortnight chiefly for delivery in the fall of 1903. Included is a 30,000-ton order from the Great Northern. Chicago reports a 50,000-ton inquiry that may have to go abroad because domestic mills cannot give desired deliveries. This activity in rails is an index of the sustained strength of the railroad demand and is one of the prime guarantees for the continued prosperity of the iron trade in 1903. It is estimated that 2,600,000 tons of rails will be rolled in 1902 and that the total output for 1903 will be close to 3,000,000 tons in view of the new capacity at Buffalo and at Ensley, Ala. The advances in iron and steel freights are to come at once in central territory and will amount to 10 per cent. The lake ore movement is about 26,770,000 tons to Dec. 1, an increase of more than 6¾ million tons over last year, making the surprising advance of more than 45 percent in two years, the movement by water in 1900 being 18,570,310 tons.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Dec. 3.

For the first time in many months, nearly every furnace in the Mahoning and Shenango Valleys is in operation and the coke shipments are improving daily. The railroads have been making great efforts to move the coke from the Connellsville region to the furnaces and during the past ten days have succeeded well. Many furnaces that were banked for several weeks are now in operation and in case the normal coke shipments continue during the remainder of the year, much will be done towards relieving the present scarcity of prompt Bessemer iron. There has been little buying in the past week of any grades of iron. Consumers who are not covered through the first quarter of next year, are holding off, evidently anticipating lower prices. With the furnaces operating at their normal capacity for two months it is believed that there will surely be sufficient iron to go around and it is on this that large buyers base their hopes for lower prices during the next two months.

There has been only moderate buying of steel recently, but the steel mills are holding prompt Bessemer at $29 to $30 per ton, and are securing the latter price on small lots. For delivery after January, the range is $28.50 to $29. Open-hearth billets, ordinary specifications, continue to be quoted at $31 at mill, and the demand is reported fair.

The old material market is at present causing dealers considerable concern. Many are short on their contracts and in their eagerness to secure material, heavy melting stock and cast scrap especially, have caused the market to advance sharply. Owing to the scarcity of pig iron, the foundries are using more cast scrap than ever before and dealers who took large contracts for this material, to be delivered before the end of the year, are in numerous instances compelled to pay considerably more for the material than they are receiving. Nor are the steel mills offering as much heavy melting stock on the market as heretofore, as they are using more scrap in their practice on account of the shortage of pig iron. These unusual circumstances combined have caused the present sharp advances.

It has now been definitely settled that freight rates on all iron and steel products will be advanced 10 percent on Jan. 1 by the roads east of Chicago. The consumer in nearly every instance will be compelled to pay this advance in freight rates, as nearly all contracts are now made f. o. b. mill.

From returns at hand it is estimated that the steel rail production this year will reach 2,600,000 tons. Estimates on the output of the mills during 1903 are placed at 3,000,000 tons, the increase being made up by the rail mills of the Lackawanna Steel Co. and the Tennessee Coal, Iron & Railroad Co.

PIG IRON.—Sales of small lots of Bessemer iron for prompt delivery continue to be made at prices ranging from $23.50 to $24.50 at the furnace. We note the sale of 200 tons at $23.50 and several carload lots at $24.25 and $24.50. For delivery in the first quarter of next year the furnaces are asking $21 to $21.50, and for second quarter delivery, $20.75, although on a large contract it is believed that $20.50 at the furnace could be done. No. 2 foundry iron for prompt delivery is quoted at $24, and we note the sale of 200 tons of No. 1 at $25 for delivery during the next ten days. There is practically nothing doing in forge and basic. We revise quotations as follows:

Bessemer, Valley	$21 50 to 22 00
Bessemer, Pittsburg	22 25 to 22 75
No. 1 Foundry	24 00 to 24 50
No. 2 Foundry	23 00 to 23 50
Gray Forge, Pittsburg	20 75 to 21 00
Chilled Basic, Valley	21 00 to 21 50
Chilled Basic, Pittsburg	21 75 to 22 25

STEEL.—German steel billets can be laid down in this district at $29 to $29.25 per ton, but there is practically no buying. Bessemer billets for prompt delivery are held at $29 to $30, while open-hearth billets are held at $31. Bessemer billets for forward delivery are held at $28.50, and $30 can be done on open-hearth. Bessemer rods are quoted at $35 to $35.50.

FERRO-MANGANESE.—English manganese for forward delivery in 50 ton lots and over is quoted at $50 per ton, delivered at buyer's mill. Small lots for prompt shipment are held at $55.

SPELTER.—There have been further declines in the spelter market and prime Western grades are held at 5c, Pittsburg, in carload lots.

MUCK BAR.—The competition of the Eastern manufacturers is resulting in concessions locally and prime muck can be had for $33.50 to $34.

SKELP.—The market continues quiet. Grooved iron skelp is held at 2c and sheared at 1.95c. Sheared and grooved steel skelp is held at 1.95c.

RAILS AND TRACK MATERIAL.—Further business has been closed for delivery in the fall of 1903. Some of the mills rolling light rails have made slight concessions and 16 and 20 pound rails can now be had at $38, Pittsburg. We revise our quotations as follows: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $44; 12 pounds, $43; 16 pounds, $41; 20 pounds, $40; 25 to 40 pounds, $38 to $39. Track materials: Spikes, 2.15c to 2.25c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

PLATES.—The market continues very strong, with a heavy demand for spot shipments, for which all the mills are securing from 1.85c to 2c. Agreement quotations are as follows: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.75c; marine, ordinary fire-box, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive fire-box, not less than 2.10c, and it ranges in price to 3c. Plate more than 100 inches wide, 5c extra 100 pounds. Plate 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5c extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

BARS.—The demand for steel bars continues fair, although some of the mills are complaining on account of the lack of specifications on pending contracts. While large producers are holding iron bars at 1.80c, independent mills are making concessions. We make the following quotations: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under 3 inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.80c, Pittsburg, with full freight added to point of delivery. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots; refined iron bars, 2.25c and upwards.

STRUCTURAL MATERIAL.—The business placed continues very large and many mills now have their books filled to July 1 next year. Agreement quotations are as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

PIPES AND TUBES.—The volume of business continues very heavy, in fact it is much heavier than that placed at this time last year. Quotations in carload lots, plus freight to destinations, are as follows:

MERCHANT PIPE.

	Steel		Guaranteed Wrought Iron	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛, ¼ and ⅜ inch	68	58	65	55
½ inch	70	60	67	57
¾ to 6 inch	75	65	72	62
7 to 12 inch	73	63	70	60
Plugged and Reamed				
1 to 4 inch	73	63	70	60
Cut 3 to 6 feet				
⅛, ¼ and ⅜ inch	63	52	60	49
½ inch	65	54	62	51
¾ to 6 inch	71	60	68	57
7 to 12 inch	69	57	65	54
Cut 6 feet and longer				
⅛, ¼ and ⅜ inch	64	53	61	50
½ inch	66	55	63	52
¾ to 6 inch	73	61	69	58
7 to 12 inch	70	58	66	55
Extra Strong Plain End				
⅛ to 8 inch	69	59	65	55

Threads only—Same as Plain End, plus 1¼ percent net.
Threads and Couplings—Same as Plain End, plus 2½ percent net.

Double Extra Strong Plain End				
½ to 8 inch	61	51	57	47

Threads only—Same as Plain End, plus 2 percent net.
Threads and Couplings—Same as Plain End, plus 3 percent net.

NOTE: Orders for less than carload will be charged at 12½ percent advance. Extra and Double Extra Strong Cut Lengths, lower random discounts by 10 percent net for 6 feet and longer, and 15 percent net for 3 to 6 feet.

BOILER TUBES.

Steel

	Percent.
1 to 1½ inches	48
2¼ to 5 inches	62½
1¾ to 2¼ and 6 to 13 inches	52½

Iron.

	Percent
1 to 1½ inches	36½
2¼ to 5 inches	45½
1¾ to 2¼ and 6 to 13 inches	35½

CASING.

	S. and S. Percent.
2 to 3 inches	58
3½ to 4 inches	60
4½ to 12½ inches	62

SHEETS.—Concessions on galvanized sheets are now being made, the quoted discounts being shaded slightly. When black sheets were recently reduced, no reduction was made on galvanized and the spread between the two has been too great. The concessions now being made reduce this considerably and the relative prices are now about the same as before the reductions on black sheets were announced. We quote as follows on 500 bundle lots: No. 28, 2.75c; No. 27, 2.65c; No. 26, 2.55c; Nos. 22 and 24, 2.45c; Nos. 18 and 20, 2.35c; Nos. 14 and 16, 2.25c; Nos. 10 and 12, 2.10c to 2.15c. Galvanized: No. 16, 2.60c; No. 18, 2.85c; No. 26, 3.35c; No. 27, 3.60c; No. 28, 3.85c; No. 29, 4.35c; No. 30, 4.50c.

MERCHANT STEEL.—From returns at hand it is evident that the production of tool steel in this country during 1902 will exceed all previous records. Quotations remain unchanged. Turned cold rolled and ground shafting is held at 47 off in carload lots and 42 percent off in less than carload lots; tire steel, 2.15c to 2.25c; spring steel, 2.25c to 2.35c; toe calk, 2.30c to 2.40c. The following differentials maintain: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less than 1,000 pounds of a size, 30 cents advance. Tool steel is quoted 7 cents and upwards, according to the grade.

WIRE AND WIRE NAILS.—A fair amount of business continues to be placed in wire and wire nails, although the consumption is not large enough to keep all the mills in full operation. We make the following quotations: Wire nails, carload lots, f. o. b. cars, Pittsburg, $1.85 to $1.90; less than carload lots, $1.95 to $2; plain wire, carload lots, $1.75 to $1.80; less than carload lots, $1.85 to $1.90; barb wire, carload lots, $2.15 to $2.20; less than carload lots, $2.25 to $2.30; staples, carload lots, $2.05, and less than carload lots, $2.15. Galvanizing, 30 cents extra. Cut nails are quoted as follows: Carload lots, $2.05, and less than carload lots, $2.10 f. o. b. Pittsburg, plus freight to point of destination. Terms, 60 days, less 2 percent off in 10 days.

OLD MATERIAL.—There have been sharp advances in the price of cast scrap and heavy melting stock during the past week, and the indications are that further advances will be made. We revise quotations, gross tons, as follows: Heavy melting stock, $22 to $22.50; low phosphorous melting stock, $24 to $24.50; steel rails, $21 to $21.25; rerolling rails, $22.50 to $23; No. 1 cast scrap, $19.50 to $20; borings and turnings, $11 to $11.50; busheling scrap, $16 to $16.50; old iron rails, $24.50 to $25.

COKE.—For prompt shipment foundry coke continues to be quoted at $7 and $8 per ton. For future delivery $4.75 to $5 is asked. For the week ending Saturday, Nov. 22, the production of the upper Connellsville region amounted to 240,058 tons, and that of the lower region to 47,120 tons.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
519 MONADNOCK BLOCK, Dec. 2.

There is little activity at the present time in the buying of either crude or finished iron and steel, and this market

may be characterized as a waiting one. Consumers appear to be in no hurry to place contracts before the first of the year, apparently anticipating further reductions in values. Interest centers chiefly in pig iron, which has suffered a relapse in values for both prompt and nearby deliveries. The famine prices that have prevailed for so many months are vanishing, and are being replaced by a more stable basis of values. The same condition is found in some lines of finished material. Little buying is being done in merchant pipe, jobbers withholding their orders in the expectation of a further decline in prices. There has been keen competition for the business that has been placed, present discounts having been shaded in some instances. Specifications for iron and steel bars have improved during the week under review, though new business is not of large proportions. Prices are still irregular. Plates are very active; and there are several large inquiries in the market for standard rails. An order for 50,000 tons for a Western system will probably be placed abroad. There is a good demand for foreign billets, orders aggregating several thousand tons having been placed in the week past. The sheet market remains in a rather unsettled state, prices being determined by the tonnage offered and delivery required. Some small lots of merchant steel have been placed, though mills are not seeking new business, being behind in deliveries and hampered by an abundance of specifications.

PIG IRON.—The most conspicuous feature of the local market is the new attitude of sellers of Southern iron on the subject of prices for the coming year. All are of the opinion that the quotations which have been current during the summer months are too high, and these are gradually being lowered. Spot iron has declined at least $1 a ton; while for delivery in the first half some furnaces are quoting No. 2 foundry on the basis of $19.50 Birmingham, and others $19. Sales of No. 1 foundry for delivery in December and January have been made at $26.65; No. 2 foundry at $26.15, and No. 3 foundry at $25.65; but even these prices can be shaded on large orders. There has been considerable buying during the week under review of iron for shipment in the second quarter, though no interest is shown in the second half. Several of the largest consumers of Southern iron have not yet bought for the first six months, and furnaces anticipate a more active movement following the lowering of prices. There are a number of large inquiries in the market, including one for 12,000 tons of basic iron, another for 20,000 tons of gray forge, a portion of which has been placed; several thousand tons of malleable Bessemer; 1,500 tons of Nos. 1 and 2 foundry; and 1,000 tons of No. 2 foundry, all the latter being for spot shipment. Furnaces in the South are making good deliveries on contracts, the mild weather having enabled railroads to loosen the traffic blockade at certain Southern points, though the car question is by no means settled. Several Northern stacks remain banked or blown out, experiencing great difficulty in getting fuel. We quote for the first half of 1903 as follows:

Lake Superior Charcoal	$26 00 to 27 00
Local Coke Foundry No. 1	23 50 to 24 00
Local Coke Foundry No. 2	23 00 to 23 50
Local Coke Foundry No. 3	22 50 to 23 00
Local Scotch Foundry No. 1	24 00 to 24 50
Local Scotch Foundry No. 2	23 50 to 24 00
Southern Coke No. 1	24 15 to 24 65
Southern Coke No. 2	23 65 to 24 15
Southern Coke No. 3	23 15 to 23 65
Southern Coke No. 4	22 65 to 23 15
Southern No. 1, soft	24 15 to 24 65
Southern No. 2, soft	23 65 to 24 15
Southern Gray Forge	22 15 to 22 65
Southern Silveries	26 65 to 27 15
Jackson Co. Silveries	31 00 to 32 00
Ohio Strong Softeners	26 10 to 27 10
Alabama Car Wheel	27 15 to 27 65
Malleable Bessemer	25 00 to 26 00

BARS.—All the mills report an increase in specifications for both iron and steel bars, and that new business is of an encouraging volume. Iron is generally quoted at 1.80c for Chicago delivery, though some mills are shading this price on large lots. The active demand for cars has brought a number of railroads and carbuilders in the market for good sized tonnages. There is an improved demand for hoops and angles. We quote mill shipments, Chicago delivery, Bessemer steel, 1.75c to 1.85c; angles, less than 3x3, 1.85c to 1.95c base; iron, 1.80c to 1.85c; hoops, 2.15c. Prices on stock from store, steel, 2c to 2.10c; iron, 2.15c to 2.20c; hoops, 2.40c to 2.50c; angles, 2.50c to 2.60c.

SHEETS.—Demand has fallen off to some extent, though specifications on contracts are good. Store trade is active. We quote No. 27 black, 2.80c to 2.90c; galvanized, 3.75c to 3.85c; for delivery from stock, No. 27 black, 3.05c to 3.10c; galvanized, 75 percent to 75 and 5 percent.

STRUCTURAL STEEL.—Independent producers report a good demand for structural shapes, mostly for light material. Deliveries on heavy sections of beams, 15 inches and over, can be made in the early months of next year, though on channels, angles, tees and zees, mills are sold up for the first six months of the year. We quote mill pirces, Chicago delivery, as follows: Beams, 15 inches and under, 1.75c to 1.85c; 18 inches and over, 1.85c to 2c; universal plates, 1.75c to 1.85c; angles, channels and tees smaller than 3 inches, 1.85c to 2c base. For prompt shipment from mills, prices on the latter are 40 cents higher than above. On lots from store, we quote 2½ to 3⅓ cents a pound.

BILLETS.—There has been a good demand for foreign billets in the past week and some large sales are reported. We quote domestic open-hearth billets, $38 to $40, according to quantity and delivery; foreign forging billets, $36 to $37.

RAILS AND TRACK SUPPLIES.—Electric railroads continue to be active inquirers for heavy sections in moderate lots, and several orders have been placed with independent mills. One Western system is reported in the market for 50,000 tons of standard rails, which will probably be placed abroad owing to the crowded condition of American manufacturers. There is a good demand for light rails and track supplies, all for delivery next year. We quote standard sections, $28; second quality, $27; light rails, 45 pounds, $34 to $35; 12 pounds, $40 to $41, with regular differentials for intermediate sizes; light rails out of store, $45 to $50. Track supplies, mill shipment, are quoted as follows: Angle bars, 2c to 2.10c; spikes, first quality, 2.25c; second quality, 2.15c; track bolts, 3½x¾, with square nuts, 2.85c to 3c per 100 pounds; with hexagon nuts, 3.05c to 3.15c, with usual differentials for other sizes.

MERCHANT PIPE AND BOILER TUBES.—The inelasticity of the present discounts is preventing many jobbers from placing orders for merchant pipe, and buying is of slight proportions. Many are withholding their contracts in anticipation of a further reduction. On such business that has been placed, prices in many instances were shaded. The boiler tube market is without change, there being a fair demand. We quote f. o. b. Chicago:

MERCHANT PIPE, RANDOM LENGTHS.

	Black. Percent.	Galv. Percent.
⅛ to ¾-in., inclusive	66½ net	56½ net
½-in.	68½ net	58½ net
¾ to 6-in., inclusive	73½ net	63½ net
7 to 12-in., inclusive	71½ net	61½ net

BOILER TUBES.

Steel.

	Percent.
1 to 1½ in.	43½
1¾ to 2½ in.	56
2¾ to 5 in.	61
6 to 13 in.	56

Iron.

	Percent.
1 to 1½ in.	39
1¾ to 2½ in.	56
2¾ to 5 in.	46
6 inches and larger	56

CAST IRON PIPE.—Demand is confined to the usual small lots which are received in the daily mail. We quote f. o. b. Chicago, 4-inch water pipe, $37; 6-inch, $36; 8-inch and upwards, $35; gas pipe, $1 a ton higher.

PLATES.—There is an active demand, the local mill having booked orders in the past month aggregating 18,000 tons. Its capacity is sold up to June. We quote mill shipments, Chicago delivery, Tank steel, ¼ inch and heavier, 1.75c to 2.10c; flange steel, 1.85c to 2.20c; from stock, tank steel, ¼ inch and heavier, 2.25c to 2.35c; 3-16, 2.35c to 2.45c; No. 8, 2.40c to 2.50c; flange steel, 2.50c to 2.60c.

MERCHANT STEEL.—Implement manufacturers continue to place supplementary contracts for small tonnages. Specifications for all materials are plentiful, mills being 60 to 90 days behind in deliveries. We quote mill shipments, Chicago delivery, as follows: Spring steel, 2.65c to 2.75c; sleigh shoe, 1.95c, flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.50c to 2.60; machinery steel, 2.15c to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.30c to 2.40c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 percent to 10 percent higher; cold rolled shafting, carload lots, 47 percent off, Chicago; less than carload lots, 42 percent off, Chicago.

WIRE PRODUCTS.—There is a good demand for all materials, jobbers in the country placing contracts for spring needs. Mills report that they are unable to accumulate any stock, the entire production going into immediate consumption. We quote prices to jobbers, carload lots, Chicago delivery, as follows: Smooth wire annealed, 1.90c; galvanized, 2.20c; painted barb wire, 2.30c; galvanized barb wire, 2.60c; wire nails, $2; cut nails, 2.20c; polished staples, 2.15c; galvanized staples, 2.45c. Prices to retailers are 5 cents higher than above quotations on carload orders, and 15 cents higher on less than carload orders.

COKE.—Shipments of coke into the market fell off considerably during the past week, creating an increased demand for spot coke. A number of Western furnaces are still banked or blown out owing to the scarcity of fuel. We quote Connellsville 72-hour foundry coke, $7 to $7.25, Chicago; for prompt delivery, $9 to $11.

OLD MATERIAL.—The market is still weak, there being practically no demand for wrought iron or steel scrap. None of the bar mills is in the market, and the improved shipments of pig iron have decreased the demand for cast scrap. We quote gross tons as follows:

Old Iron Rails	$24 00 to 24 50
Old Steel Rails (mixed lengths)	18 00 to 18 50
Old Steel Rails (long lengths)	23 00 to 23 50
Relaying rails	31 50 to 32 00
Old wheels	22 50 to 23 00
Heavy melting steel	16 50 to 17 00
Mixed country steel	15 00 to 15 50

The following are selling prices per net ton:

No. 1 R. R. wrought	$19 50 to 20 00
No. 2 R. R. wrought	18 00 to 18 50
Shafting	19 50 to 20 00
Dealers' forge	16 00 to 16 50
No. 1 busheling	14 00 to 14 50
No. 1 Cast	16 50 to 17 00
Railway malleable	16 00 to 16 50
Country malleable	14 50 to 15 00
Iron axles	23 50 to 24 00
Steel axles	19 50 to 20 00
Cast borings	10 50 to 11 00
Wrought turnings	13 50 to 14 00
Iron axle turnings	14 50 to 15 00
Steel axle turnings	13 00 to 13 50
Stove plates	12 50 to 13 00
Old iron splice bars	21 00 to 21 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Dec. 3

While there has not been a great change in general conditions since last week, the hesitancy concerning buying, which has existed for weeks in view of reductions in prices of wire sheets, tubes and other products, seems to be less pronounced. It is true that buying is almost exclusively for immediate needs, but the fact that such orders are numerous and of fair size indicates that constant demands are heavy and that prosperity is not waning.

IRON ORE.—The season on the lakes is practically ended. Insurance expires Friday, lights are being turned out, storms are raging and few boats are on the water. The season has been remarkable for the tremendous amount of ore shipped and for the uniformity of freight rates. Few vessels have been chartered above 85 cents from Duluth, 70 from Marquette and 75 from Escanaba, although $1 has been paid from Duluth in the past ten days. There has been much complaint throughout the year in regard to dispatch of vessels and the average time of detention of vessels at Lake Erie ports has been about three days, but, in view of the tremendous demands which have been made upon railroads from all kinds of shippers, the handling of ore has proceeded with a rapidity that reflects credit on all concerned. Furnaces will have all the ore they will need.

Official reports of ore shipments from all Northern ports for November have not been received, but with the November shipments of two smaller docks estimated, the total is 2,750,000 tons, making the total for the season up to date 26,770,000 tons. The shipments last year after Nov. 1 were 2,006,096 tons, and the total for the season to Dec. 1 last was 20,000,026, against 18,570,310 tons for the entire season of 1900. With the all rail shipments added to this year's total of water shipments, the grand total will be nearly 7,000,000 tons in excess of that of last year.

PIG IRON.—Very few sales are being made. The continuance of the strike in the light gray iron foundries has reduced perceptibly the demand for iron and coke. No. 2 Southern for spot delivery is selling at $25.70, Cleveland, and No. 1 Northern at $27.95. There are few inquiries for the second half and rates are at a standstill. For that period prices asked are on a basis of $22.75 Cleveland for No. 1 foundry, and $21.75 for No. 2. Foreign is selling at the following prices: German, $25.50; Scotch, $24.50 to $25.50; English, No. 2 Middlesboro, $23.50 to $24. We quote domestic as follows for shipment in the first half of 1903:

Bessemer	$21 75 to 22 25
No. 1 Strong Foundry	23 00 to 23 50
No. 2 Strong Foundry	22 50 to 23 00
No. 3 Foundry	21 75 to 22 25
Scotch No. 1	23 00 to 23 50
Scotch No. 2	22 50 to 23 00
Gray Forge, Valley	20 50 to 20 75
Lake Superior Charcoal	25 00 to 26 00

BILLETS.—There have been rumors of sales of domestic billets at $28 Cleveland, but investigation shows that this price applied to a single lot of steel which did not come up to specified analysis. The delivered price is now in the neighborhood of $29.50.

FINISHED MATERIAL.—The price of 1.80c Pittsburg for bar iron, quoted by some of the principal producers, is nominal. The real selling price is 1.70c Pittsburg and just now not much is being sold. The price of steel, 1.60c for Bessemer and 1.70c for open-hearth, Pittsburg, which has long prevailed, is still firmly adhered to and a fair amount is being sold. Plates are still the strongest feature of the market and there is nothing new to be said about them. Structural material is not quite so hard to get; that is, within reasonable time. While 1.70c is the price without guaranty of delivery, shapes can be had at from 2.35c to 2.50c for delivery within 30 days. The sheet market continues dull and the cutting of prices by smaller producers is still carried on, to the astonishment of many observers. The expected revision of prices by the principal producer has not been announced and it is not known whether it will be at any time in the near future. The prices of the distributors of the product of the principal producer, are as follows: For 3-16-inch sheets and heavier, 2.10c to 2.15c, Cleveland. Mill sales of black sheets, Cleveland, to consumers: No. 24, 2.65c to 2.75c; No. 26, 2.75c to 2.85c; No. 27, 2.85c to 2.95c; and the following prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.50c to 2.60c; No. 16, 2.55c to 2.70c; Nos. 18-20, 2.75c to 2.90c; Nos. 22-24, 2.85c to 3c; Nos. 25-26, 2.95c to 3.10c; No. 27, 3.05c to 3.20c; No. 28, 3.15c to 3.30c. On galvanized sheets we quote mill sales in carload lots, Cleveland, as follows: Nos. 10 and 11, 2.60c to 2.75c; Nos. 12-14, 2.70c to 2.85c; Nos. 15-17, 2.80c to 2.95c; Nos. 18-21, 3c to 3.15c; Nos. 22-24, 3.30c to [illegible]; Nos. 25-26, 3.55c to 3.70c; No. 27, 3.80c to 3.95c; No. 28, 4.05c to 4.20c; No. 29, 4.45c to 4.60c; No. 30, 4.95c to 5.10c. Galvanized sheets out of stock are quoted 75 and 2½ off.

OLD MATERIALS.—Owners of mills have evidently come to the conclusion that as long as the market for bar iron is so dull, with frequent concessions from official prices, it is not profitable to buy scrap at present prices and the result is that the old material market, so far as mill supplies are concerned, is extremely dull. Yet there has been little, if any, change in prices. The demand for machine cast scrap continues brisk. We quote Cleveland prices, all gross tons, as follows:

Old iron rails	$25 50 to 26 50
Old steel rails (over 6 feet)	22 00 to 23 00
Old steel rails (6 feet and under)	21 00 to 22 00
Old car wheels	20 00 to 21 00
No. 1 R. R. wrought scrap	20 00 to 21 00
Mill scrap	19 50 to 20 00
No. 1 machine cast scrap	21 00 to 21 50
Iron axles	29 00 to 30 00

Steel axles	$28 00 to $29 00
Axle turnings	18 50 to 19 50
Wrought turnings (free from cast)	16 00 to 17 00
Cast borings	11 00 to 12 00
Uncut wrought iron boilers	13 00 to 15 00
Steel boiler plates	17 00 to 18 00
Grate bars	12 00 to 13 00
Pipes and flues (clean)	17 50 to 18 50
Tank iron	17 00 to 18 00
Hoop and band iron	13 50 to 14 50
Sheet iron	13 00 to 13 00
Wrought drillings	15 00 to 16 00
Malleable iron (railroad)	20 50 to 21 50
Malleable iron (agricultural)	17 50 to 18 00
Stove plate	15 00 to 16 00
Heavy steel	18 50 to 19 50

CINCINNATI.

Dec. 2.

The past week has developed nothing of importance in the general situation. Coke continues firm with sales of foundry coke, quick shipment, at $6 to $7.50 at ovens. For next year's delivery contracts continue mainly at $5 cash ovens. Pig iron prices continue irregular, but it is believed that values have settled to a plane where greater stability will obtain. In finished material prices are unchanged and the market is quiet.

PIG IRON.—Interest continues largely centered in spot iron because transactions are mainly for immediate delivery. Buyers are pursuing a conservative attitude in regard to future supplies and it is probable that to some extent they will pursue a hand-to-mouth policy for the next few months. Prices have made but little change. The volume of business has been fair but principally confined to small lots for this month's shipment, although a few orders have been booked for the first quarter and some for the second quarter of next year. In the second half of next year very little business has been done, but for No. 2 foundry $18 to $18.50 Birmingham about represents the market. For the first half of next year No. 2 foundry is offered at $19 Birmingham. The feeling in the trade on the part of both buyers and sellers is that easier prices will prevail before the close of the first quarter of 1903; still it is believed that many consumers have not provided for their wants through the first half and will be obliged to come into the market for iron, and as freight rates will advance about Jan. 1, and cost of labor and coke have advanced, these supporting features tend to offset the easier tone, so that no heavy decline in values is expected. There has been some reduction in prices for Northern irons. The lower grades of iron continue extremely dull with prices nominal. Southern furnaces are producing well and when cars are obtainable deliveries are reasonably prompt. It appears that the demand, although scattered and for small lots, is about absorbing the supply available for immediate shipment, so that sales agents report no accumulations to be worked off. We quote for spot delivery or immediate shipment as follows f. o. b. Cincinnati:

Southern Foundry No. 1	$23 25 to 25 00
Southern Foundry No. 2	22 25 to 24 00
Southern Foundry No. 3	21 75 to 22 25
Southern Foundry No. 4	19 25 to 20 00
Southern Foundry No. 1, soft	23 25 to 24 00
Southern Foundry No. 2, soft	22 25 to 23 00
Gray Forge	18 75 to 19 25
Northern Foundry No. 1	26 10 to 26 60
Northern Foundry No. 2	25 10 to 25 60
Southern car wheel iron	28 00 to 29 00
Malleable coke iron	25 00 to 25 75

FINISHED MATERIAL.—The market is quiet, with no change in prices. The demand is mostly for small lots and the trade has the usual appearance noticed in the closing days of the calendar year. At recent reductions a steady tone prevails. Sales of black sheets No. 27 are at 2.75c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 3.20c; No. 27, 3.10c; No. 16, 2.75c; No. 14, 2.65c; No. 12, 2.55c; No. 10, 2.45c. Galvanized sheets car lots sell at 75 and 10 percent off; less than car lots, 70 and 10 percent off. Tank plates out of store are quoted at 2.25c for ¼-inch and 2.35c for 3-16-inch. Prices for bar iron in carload lots are: 1.80c base, half extras f. o. b. Cincinnati; steel bars, 1.72c base, half extras f. o. b. Cincinnati. Both are retailed at 2c base, half extras, out of store. Beams and channels are selling at 2¼ to 2¾c, retail, and angles at 2.15c to 2.25c for base sizes. Merchant pipe and boiler tubes are quoted as follows for carload lots f. o. b. Cincinnati:

MERCHANT PIPE.

(Basing discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛, ¼, ⅜-inch	66.8	56.8	63.8	53.8
½-inch	68.8	58.8	65.8	55.8
¾ to 6-inch, inclusive	73.8	63.8	70.8	60.8
7 to 12-inch, inclusive	71.8	61.8	68.8	58.8

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1½ in.	43.8 & 5	33.8 & 5
1¾ to 2½ in.	56.3 & 5	36.3 & 5
2¾ to 5 in.	61.3 & 5	46.3 & 5
6 to 12 in.	56.3 & 5	36.3 & 5

OLD MATERIAL.—Supplies are comparatively light and the demand good. Some descriptions are quoted higher than a week ago, notably old iron axles, old chilled car wheels and cast borings. We quote:

Old No. 1 Wrought Railroad, net tons	$19 50 to 20 00
Cast Machine and Foundry, net tons	18 50 to 19 00
Old Iron Rails, gross tons	24 00 to 24 50
Old Steel Rails, gross tons	22 00 to 23 00
Old Short Lengths, gross tons	18 50 to 19 00
Old Iron Axles, net tons	25 50 to 26 00
Old Chilled Car Wheels, gross tons	22 50 to 23 00
Stove Plate, net tons	11 50 to 12 00
Wrought Turnings, net tons	14 00 to 14 50
Cast Borings, net tons	12 00 to 12 50

NEW YORK.

OFFICE OF *The Iron Trade Review*.
ROOM 1909, NO. 150 NASSAU ST., Dec. 2.

PIG IRON.—The pig iron market in this vicinity during the past week, taken as a whole, was quiet. The reason generally given was that December is always marked by a lull in trade, and that not only should dullness be expected, but that it should not be interpreted as having any valid bearing on what the future would bring forth. Both officials and sales agents of furnaces here report inquiries to be very good, but that sales as a result of them are few and far between, and always for small lots. While producers are strong in their insistence that 1903 will be a repetition of this year, both in the demand for pig iron and the prices that it will command, consumers, on the other hand, are equally positive that lower prices for next year will prevail. This belief has taken hold so firmly, that consumers are buying only in such quantities and for such delivery as imperative needs require. We find that many who have now, for the first time, given some attention to supplying their wants for next year, are disposed to limit their purchases to the end of the first quarter. So far as domestic irons are concerned, buyers are either confronted with no iron being available, or, if it is, they are forced to pay higher prices than would have been the case had they bought several weeks ago. This makes them turn to foreign irons, and representatives of the latter here say that recently they have had more inquiries for the first quarter than at any time thus far. While there are some consumers who are willing to contract as far as the first six months of the new year, we note the strongest disinclination among the majority of them to contract for the latter half of the year. Some of the Southern furnaces report that inquiries for the latter half have picked up recently. During the past week we have heard of a sale of about 4,000 tons of Southern No. 1 and No. 2 foundry, on the basis of $20 and $19 respectively at the furnace, for delivery during the last half of 1903. For the same period, we note a sale of a small lot of No. 2 Southern foundry at $18.50 at the furnace. This is the lowest price recorded for that grade and delivery that we have heard of in this market. Among Northern furnaces for the first half of the new year, we hear of several thousand tons of No. 2 X being offered on the basis of $24 at the furnace, with no takers, delivery from January on. We understand that offerings of this grade at $23.50 find a ready sale. The foreign iron situation has changed little during the week beyond what we have stated. Middlesboro No. 3 continues in good request, though not as much as formerly, and can easily be had in large lots at $18.75, New York delivery duty paid, while a good customer could be accommodated for $18.50, and perhaps a shade lower. Scotch furnaces report that demand from this country has let up a little of late, and as a result prices are a little easier, with some good brands and measuring well up in analyses to buyers' demands, to be had as good as $21, New York delivery, duty paid. German irons continue in popular favor, and some good orders are being placed at about $20.50, New York delivery, duty paid. Shipments on old or-

ders for domestic irons are being pressed greatly nowadays, but now the railroads are coming in for criticism in this connection. New York prices for 1903 are as follows: No. 1 X Northern, $23.25 to $24.75; No. 2 X, $22 to $22.75; No. 2 plain, $21 to $21.75; Southern No. 1 foundry, $23.25 to $23.50; No. 2 foundry, $22.25 to $22.50; No. 3 foundry, $21.50 to $22; No. 4 foundry, $20.50 to $21.50.

RAILS.—A leading authority estimates the sale of steel rails in large lots during the last fortnight at over 200,000 tons. Inquiries are reported to be better now than ever, and the prospects of some good sales in the near future are very bright. There is some talk of higher prices for standard sections for next year, but our advices are that they will probably continue to be $28 at the mill.

BILLETS.—German billets continue irregular in price. Our information is that large lots can be had at $26.50 at seaports. For small quantities $27 is the maximum. The collector of the Port of Baltimore announces that German steel billets aggregating in value $400,000 have arrived at that port during the past four months.

FINISHED IRON AND STEEL.—The demand for structural material for next year has suffered no abatement, and many orders are withheld because satisfactory delivery cannot be promised. The American Bridge Co., during the past week, closed one contract of 3,500 tons for a Western railroad, and one of 4,000 tons with an Eastern railroad. It also closed two smaller contracts, aggregating 1,800 tons, for this city. The demand for plates continues to be on an enormous scale, one authority estimating it to be about 50 percent more than the productive capacity. It is pointed out that the situation in plates at present has many of the features which prevailed in 1899. Then plates sold at 3 cents, with the supply far below requirements, and engineers and architects drafted their plans expressly to avoid the use of them, so far as possible. As a general rule this was done by lattice girders for plate girders, and roll beams of shallow depth for plates. It is believed here the situation will necessitate something in this direction next year. There is a firmer tone to sheets, but the demand is of the meagre kind. Bars are steady, with ex-store business not as brisk as formerly. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c: angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.95c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 2.10c to 2.15c; flange, 2.25c to 2.30c; fire box, 2.30c to 2.50c; refined iron bars, 1.95c to 2c; soft steel bars, 1.95c to 2.10c, steel sheets, in carloads, New York, No. 28, black, 3.05c to 3.15c; galvanized, 75 and 7½ off.

PHILADELPHIA.

Dec. 2.

The general trade situation is somewhat more favorable than it was a week ago. Decided improvement in transportation has been an important factor. There is, however, still a tendency toward lower prices. Manufacturers of iron who say they cannot reduce prices are finding that consumers are taking English, Scotch, German, and Canadian iron. The ultimate result will be that American iron will come down, but how soon that will be, is difficult to predict.

PIG IRON.—There is little change from last week. Buyers are paying $23.50 to $24.50 for No. 2 X foundry, this year's shipments, and about 50 cents less for the first half of the coming year. Other quotations are as follows: No. 2 plain, $22.25 to $22.75; gray forge, $21 to $21.50; Middlesboro, $21 to $22; Scotch, $23 to $24.50; or for cargo lots, one to two dollars less for deliveries ex ship duty paid.

BILLETS.—Domestic steel is quoted at $30.50 to $31.50 and foreign at $26.50 to $27. There is a fair demand for small lots and some inquiry for large lots for delivery next year.

FINISHED MATERIAL.—Plate trade is in a very vigorous condition, but coal shortage still curtails the output. Structural mills are doing good business, but are pretty well up with their orders and are not getting as high premiums as they did. We quote as follows: Plates, small lots, 2.10c to 2.15c; carload lots, ¼-inch and thicker, 2c to 2.05c; universals, 2c to 2.05c; flanges, 2.10c to 2.20c; fire box, 2.25c to 2.30c; marine, 2.30c to 2.35c. Steel bars, 1.80c to 1.85c, prompt shipments from local mills. Western steel, 1.75c to 1.80c; bar iron brings 1.92c to 1.95c for carload lots as minimum quantity. Next year's deliveries of structural material are quoted at 1.72c to 1.80c, but for prompt shipments mill specifications command all the way from 2c to 2.20c.

BIRMINGHAM, ALA.

Dec. 2.

There has been a good deal of speculation concerning Mr. Julian Kennedy's visit to Alabama the past week. It is known that he examined and reported on the properties of the Jenifer Furnace Co. last week, and today it is reported these properties have been taken over by a Philadelphia syndicate. Just who are the purchasers or what is their intention cannot be learned at present. It is believed that other developments will follow. The Jenifer Furnace Co. properties comprise considerable brown ore lands, some red ore property, and their coal mining plant at Connellsville in Tuscaloosa County, where they have 100 coke ovens. One furnace stack 75x16 feet is owned and now in operation at Jenifer, in Talladega County. This stack was rebuilt in 1901.

The iron market has been quiet. The few spot sales reported have been on a basis of $21 to $21.50, Birmingham, for No. 2 foundry; $19.50 to $20 for the first half, and $18.50 to $19 for the second half of 1903. The coke situation is considerably easier as to supply, and the price has declined somewhat. Sales are reported all the way from $5.25 at the ovens for furnace coke, to $6.50 ovens for foundry purposes. The coal market is strengthening in anticipation of the shut-down of the mines during the holidays, and consumers generally are making vigorous efforts to obtain some surplus.

The Southern Soil Pipe Co. announce that their plant at North Birmingham will be completed before the end of the year. S. L. Russell, president, states that it will be one of the largest of the kind in the South.

H. A. Turner, who for the past year has been chief engineer of the Tennessee Coal, Iron & Railroad Co., has opened offices in the Chalifoux Building as consulting engineer.

It is understood that the control of the stock of the Eumawhee Mining Co., owning a large body of gray ore in Talladega County, has recently changed hands, and the new owners will develop the property on an extensive scale.

The Valley Iron Co., organized the past summer, has closed contract for the erection of 300 coke ovens on the Alabama Great Southern Railroad, and expects to be making coke within 90 days. They are opening coal and ore mines, and expect to market their output of ore, coal and coke pending the construction of furnace plant for which plans have been prepared.

The Tennessee Coal, Iron & Railroad Co. has had its new rail mill in operation for more than two weeks. It is understood a good quality of 60-pound rail is being produced, but for the present none will be put on the market.

Republic Iron & Steel Co.

(Special Telegram.)

CHICAGO, Dec. 3.—In an interview with President A. W. Thompson, of the Republic Iron & Steel Co., the published reports that this company had purchased a tract of land in Youngstown across from the Haselton Furnace and would build upon it a large steel plant for the manufacture of billets and structural steel next spring, were absolutely denied. Mr. Thompson stated that the only enlargements contemplated in the Youngstown plant, and which are in process of construction, are the installation of two 10-ton converters to replace the two of 5 tons capacity now in use, new blowing and reversing engines of larger horsepower capacity and a new train of rolls. These improvements are in line with the policy of enlargements decided upon by the company some months ago, announcement of which has previously been made. The company has no intention whatever of building a new plant.

The report that Thomas Carlin's Sons & Co., Allegheny, Pa., intend to remove their plant from the present site has been officially denied. At the present time additional equipment is being added to the foundry and machine shop, at a cost of $50,000.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM NO. 150 NASSAU ST., Dec. 2.

PIG TIN.—After reaching 24½c, the lowest price that has been noted, since the recent extensive manipulation began, the pig tin market during the past week rallied about 50 points, and today closed strong. The demand, however, continues to be limited, thus placing the metal at the mercy of manipulators, who can now move it at will to suit their purposes. In London, while the demand has been poor, prices of both spot and futures have advanced, the former being £2 higher than at this time a week ago. The closing prices today at the Metal Exchange were as follows: Spot, 25c to 25.25c; December, 24.80c to 25c. London closings today were as follows: Spot, £114; futures, £112 17s 6d. The arrivals at Atlantic ports during November were about 3,000 tons. The American visible supply is estimated at 3,710 tons in store, and 2,755 tons afloat. The world's visible supply increased during November 2,293 tons.

COPPER.—There was no abatement during the week of the depression which has characterized the copper situation for weeks past. Buyers continue to keep away from the market, and not a single sale was executed during the past week at the Metal Exchange for any kind of copper, and prices, therefore, are nominal. The belief that lower prices will prevail is still as strong as it ever was. Current quotations here remain about the same as they were a week ago. In London prices during the week were the lowest of any since the early part of the present year, chiefly because of unfavorable reports regarding consumption. Today's closing prices at the Metal Exchange were as follows: Lake, 11½c nominal; electrolytic and casting, 11¼c nominal; standard, 10½c nominal. Today's London closings follow: Spot, £50 11s 3d; futures, £50 17s 6d. Exports during November were 10,520 tons, the lowest for any month of the present year. For the eleven months of the year ending December 1, the total exports aggregated 153,206 tons. For the same period in 1901, they were 83,778 tons, and for 1900, 141,117 tons.

PIG LEAD.—The ruling price for 50 tons or more continues to be 4.12½c. In St. Louis, the market developed some strength during the week, being steady at 4c. London declined a little, being quoted now at £10 12s 6d. Although published reports all declare that the proposed merger of prominent lead interests will be effected in the early part of January, we are reliably informed that the negotiations at present do not warrant them.

SPELTER.—Lower prices were the rule in this market during the week. Spot is quoted at 5.10c nominal, with sellers at 4.95c, December to January. In St. Louis, values declined on increased offerings, and prices are lower today by at least 10 points than a week ago. Recent advances in London were well maintained during the week, and prices remain unchanged at £19 17s 6d.

ANTIMONY.—Cookson's has been selling at 9 and 9½c, Hallett's at 7½c and other brands at 7¼c. Demand moderate.

NICKEL.—Unchanged. Prices average 40c to 60c, according to quantity.

QUICKSILVER.—Jobbers only are in the market, and sales have been made on the basis of $48 per flask in lots of 100 flasks. London, £8 15s.

CHICAGO.

OFFICE OF *The Iron Trade Review*.
519 MONADNOCK BLOCK, Dec. 2.

The buying of metals has not been marked by any strong demand. The price of copper has been irregular; spelter has had a declining tendency, and tin has also been weak. We quote jobbers' prices as follows:

Lake copper, carload lots 11½c; less than carload lots, 11¾c to 12c. Pig tin, 26½; pig lead, carload lots, 4.05c to 4.07½c; less than carload lots, 4.10c. Sheet zinc, carload lots, 6½c, and 6.65c in lots of 600 pounds. Spelter, carload lots, 5.25c; less than carload lots, 5¾c to 6c. Antimony, 10¾ to 11c for Cookson's and 9¾c for Hallett's in small quantities. Nickel, 50c to 60c, according to size of order and delivery. Demand for old metals is in sympathy with that for new. Selling prices of dealers are as follows: Copper wire, $10.38; heavy copper, $10.38; light copper, $9.38; red brass, $10.50; yellow brass, $8; light brass, $6.50; lead pipe, $3.90; zinc, $3.75.

LIMITATION OF OUTPUT BY MOLDERS.

BY JAMES A. MURPHY.

The restriction of output, the abolition of the level minimum wage rate and the adjustment of the present apprentice law on an equitable basis, are points that stand out very prominently in the deliberations of the National Founders' Association at the meeting recently held in Detroit. Without doubt the molders' organization cannot afford to ignore these questions very much longer, if it is to command the respect and confidence of foundrymen in general.

The restriction of output and its many ramifications suffice in nearly every instance to cover the multitudinous complaints of the iron founders. I have no sympathy whatever with the man or organization who is not willing to pay the molder decent wages consistent with his ability or will not offer him fair conditions as to working time and healthful surroundings; but the interference of one man with another as to the amount of work each shall accomplish is intolerable in the majority of instances. I can easily imagine cases where a certain amount of interference may be just, but as a general rule this setting of a "day's work," beyond the confines of which no one dares to go, is antiquated and nonsensical in these days.

That the Molders' Union as an organization at the present time is in favor of a restricted output I have good reasons to doubt from many cases which have come under my personal observation during the past few years. I believe that as far as restriction goes this is rather a sentiment confined for the greater part to the floating element in the union which is hard to control. In its action it is antiquated and unjust, to be sure, but firmly established just the same. Some of the molders who come under this classification even go so far as to try to influence apprentices to do only half as much work as a molder and through this they probably often succeed in getting some poor boy discharged by the foreman who is not up to this kind of a game.

There is every evidence that a good many of the molders are becoming more liberal in their views and are beginning to see things in a broader light. The sooner shop committees and other functionaries stop telling the molders in the morning how many castings of this and that pattern are to be considered a day's work the better it would be for the molders themselves. What the Molders' Union should do is to embody a clause in its constitution forbidding locals, under penalty of forfeiture of charter, to fine, suspend, expel or in any manner censure any member for the reason that he may have accomplished more work in a day than some one else, or as it is rather euphemistically called "killing the job."

It is hardly to be denied that there are hundreds of unprincipled employers who neither could nor would be satisfied under any conditions, but it is still more difficult to ignore the fact that there are thousands of molders who could never do too little to suit themselves and these are constantly dinning into the ears of honest workmen their principle of doing as little as they can for the most wages they can get, often winding up the argument in favor of this with the exclamation, "I will be as rich at the end of the year and receive as many thanks as those that kill themselves." During the past few years I have on several occasions discharged men for not doing enough work. If I have improved the rigging or method for turning out a certain casting I have demanded that the better facilities should show an increased output, although never asking for anything not easy of accomplishment. If I did not receive anything in return for better facilities

I have invariably followed the policy of discharging men until I received what in my opinion was an honest day's work, and I must say in justice to the local as well as the National union, that though they were importuned to take up the cudgel for these molders who refused to take advantage of improved appliances, they unhesitatingly maintained a vociferous silence.

To cite one case: We had certain wheels in our shop on which there has been a "set day's work" for a number of years. Some time ago I had an opportunity to lower the cost of producing these castings through getting up a better rigging, by which less time would be required in molding. Therefore I went to considerable expense, expecting to reduce the cost of molding at least 25%. At the time of starting this improvement I did not imagine that I would have to employ much strategy to carry out my ideas, particularly as the molder working on these castings was a resident of the city and apparently a steady and honest workingman. My surprise came later on when he positively refused to lower the time required in molding these castings, in the face of the fact that he did not have near as much work to do as before. As these castings were a particular sort of job and had to finish up clean all over, no two being alike in every detail, being made to accommodate different styles of governors used on the engines, there was great liability of mistakes being made by anyone but a molder acquainted with the job. I therefore compromised at the time by receiving a slight increase in the number of castings turned out of the larger sizes. This compromise, though unsatisfactory to me when it was made, give me time to think out a way of overcoming the difficulties confronting me; and while the molder was no doubt tossing bouquets at himself over his victory I unceremoniously removed him, bag and baggage, one evening, and put a man in his place shortly after that who did so much better that I really reduced the cost of molding these castings more than I had originally expected to do. I have reduced the molding time on several jobs from 10 to 80 percent from what I found it in several foundries, and never have I had any trouble with the union. It is to be admitted that strategy must at times be employed by the foreman, for in many instances he is the maker and unmaker of trouble and oftentimes has more points up his sleeve for the betterment of conditions for all concerned than either proprietors or molders are aware of.

The minimum wage rate as at present enforced is fundamentally wrong. Just so sure as there are many molders who are worth twice the figures which are fixed, just so sure is it that there are several who are not worth half of what one is forced to pay them. Some of the latter are not worthy of being considered in the category of molders at all. On this account there should be a differential wage rate. The snap and bench molder can never be considered worth as much as the men who make castings weighing thousands of pounds.

It has been my fortune in common with hundreds of other foundry managers to be compelled to hire men from time to time whose qualifications as workmen are unknown. Invariably I have found that on first class work 90 percent are not worth, in a machinery foundry, the room taken up by the soles of their shoes. These are the fellows who do the most sputtering about "union principles" etc., when the wonder is that any reputable trade organization should grant them a card, which enables them to bunco several foundries before they strike a shop having a class of work which they can do. I never pay such molders the minimum wage rate, but generally size them up quickly and allow them what I honestly think they have earned, when I let them shape their course for some more propitious spot. The union has never caused me any trouble because I followed this course, indeed I do not believe that it really expects such incapable workmen to receive mechanic's wages.

While it is true that there are establishments watching every chance which offers to take a small technical advantage of the men employed therein, so will one also find a set of men who are all the time watching for an opportunity to take advantage of the firm. We hear considerable about the foundry foreman who is always taking advantage of his men and attempting to increase the output by unreasonable means, but is he any worse than the molder who with the connivance of the balance of the men in the shop, and perhaps a new local union, starts in to fool the boss on the time required on a new job, by ramming up courses of sand which are not over 3 inches deep? I have seen men put in a week on a job that could easily be made in two days, and in cases where the foreman is not an experienced molder he becomes a lead weight around the neck of the firm. Taking advantage of one another breeds distrust and contempt on both sides and gives rise to that discontent which sooner or later, volcanic-like, ends in open rupture to the ultimate loss of all concerned.

The golden rule, common, rugged, insistent honesty, mutual forbearance and a proper and wholesome respect for the rights of each other will go farther towards promoting good feeling, harmony and liberal shop output than all the artful red tape, hide bound agreements, rules that are never read or obeyed, and other formulas which some people believe are necessary to the proper management of an establishment. With the introduction of superior facilities for turning out castings, let these be machines, improved flasks or other shop riggings, the firm is justly entitled to receive more castings and the molder who refuses to do what is honest, or quits because he has to, only injures himself, his shopmates and his organization. He is just as bad and no worse than the fellow who keeps telling everybody else that they are doing too much. I always make it a rule to discharge anyone who interferes with another in regard to the amount of work he does, if I can by any means prove this to a certainty.

LAKE SUPERIOR IRON MINES.

It is reported that negotiations are pending for a sale of the Champion mine on the Marquette Range. This mine, though now in operation about 34 years, is said to show larger reserves than at any time in its history. This condition has been brought about by the policy adopted several years ago of persistent sinking and opening. The ore body now shows a maximum width of nearly 100 feet. The cost of production is shown to be much less than at any previous time.

The mines of the Interstate Mining Co. (Jones & Laughlins Steel Co.) on the Mesabi range have closed down, with an output of 140,000 tons. Of this 88,000 tons was from the Lincoln and 52,000 from the Grant, one a fee, the second a State lease. At the Lincoln, Manager Fairbairn is preparing for an output of 250,000 tons next year, while at the Grant the small shaft is being doubled in size and about 100,000 tons will be mined in 1903. Were it desirable, production might be much more than this.

The Minnesota Iron Co., which is the Mesabi branch of the United States Steel Corporation, has let enormous stripping contracts the past day or two, in all about 1,200,000 yards. Of this 700,000 yards is to the Drake & Stratton Co. and is to be from the surface over the Day mine at Hibbing, while the rest is for the Burt mine, adjoining the Day. A contract for more than 200,000 yards was let for the latter to Winston Bros. & Dear last spring, and this is an additional amount to the same firm and will strip the ore body to its north line. The two mines are one deposit and will be mined together as a steam shovel proposition. Both have been mined underground, the Day in a small way. With stripping at the Fayal, Stephens, Mountain Iron, Adams, Sauntry and elsewhere at Virginia, and at the Moore, of the Cascade range, and Dober, of the Menominee range, the steel corporation will be an immense stripper during the winter and coming year.

Maas shaft at Negaunee, that has been hung for six months, is now moving down again and is only about 17 feet from ledge. It is 139 feet deep and has been under way a year.

The Fayal mine had shipped to Nov. 30 about 1,900,000

tons and was shipping Dec. 1st at the rate of 5,000 tons a day, all from shafts. Hibbing mines of the steel corporation have closed and not many properties other than Fayal and Stevenson are still working on the range. On the Gogebic, the Norrie group is still busy and with Tilden is shipping 10,000 tons daily.

Corrigan, McKinney & Co. have leased the idle shaft at Jackpot from Jones & Laughlins, and will use it to reach their Winona exploration of the Gogebic range. They will drive a tunnel from its foot and hope to get into ore at no great distance. They will probably sink a shaft in Winona ground also. From old Colby, which they have been operating this year, they have shipped some 20,000 tons, and are developing it as fast as convenient. Old Ironton, also theirs, is to have shaft deepened during the winter in preparation for a larger output another year.

At the Jordan mine, a milling property owned by a Cleveland firm, they are now running drifts in the ore body and are raising the mined ore from this work and dumping it in the pit, ready to be milled down and hoisted next spring. This in preference to making a stockpile, which would have to be handled by shovel into cars and would require new ground room. A new shaft will be sunk at the Chisholm, in section 28 T 58 R 20, close to the county road and near the center of the property, north and south. C. A. Congdon and associates, who are exploring adjoining the north forty of the Chisholm, are said to be getting some ore. The 40 acres cornering on this exploration to the northeast has been leased to the Great Northern road, though no exploration has been done there. Just northeast of this tract lies the Jordan mine. East from the Jordan Samuel Hoar is at work with his patent sand shaft sinking device, trying to help out the Shenango people, who have been striving for a year to get a shaft that would stay put down to the ore on their property. They have sunk three in their efforts. The ore is only about 100 feet down, but there is much water, a big swamp joining, and a seam of quicksand with gravel over ore. East of the Shenango the Clairton is being opened. It lies in the se of the nw ¼ of section 23, and is almost surrounded by undeveloped ore belonging to the Minnesota Iron Co. (U. S. Steel). The latter company is opening the Clairton under an operating contract with the Clairton Steel Co., owner in fee of the mine. Northeast of the Clairton lies the Croxton, which is being opened under the management of Jos. Sellwood. Some scattered exploration is going on at various points along through this township, but the above is about all the work of importance in that part of 58-20 from Longyear lake east to the boundary of 58-19.

Explorations in school section 16 T 56 R 23, on the west end of the Mesabi range, and in section 15 adjoining, are claimed by the local newspapers to have disclosed a large find of good ore. Particulars do not, however, bear out the claims as to the size and class of the discovery.

Stripping operations will be continued by the Biwabik all winter. A new through cut will be made in order that ore may be more easily taken out.

Stripping will continue at the Sauntry all winter, with one machine at work. At the Fayal likewise, and at the Adams two shovels will work. At Kinney and Sharon, stripping continues nearly all winter; at Burt, all winter with several machines; at Stevenson with several also; at Hawkins with one, and at Leetonia with one or two. So there will be a great deal of surface work under way during the cold weather. Not only what is mentioned above but at a few other properties will there be some of this class of work. On the Cascade range the Oliver Iron Mining Co. will strip the Moore, a lean silicious property, but will not use steam shovels in doing it. On the Menominee they will strip the Dober, where there is a surface of 16 feet over a comparatively small area of ore.

The Semet-Solvay Co. is building at Tuscaloosa, Ala., a new plant of 40 coke ovens having a capacity of 375 tons of coal per 24 hours. It will supply coke to the blast furnace plant of the Central Iron & Coal Co., of Tuscaloosa. The plant will be put into run in the summer of 1903.

Malleable Castings Consolidation Completed.

Wm. C. McMillan, of the Michigan Malleable Iron Co., Detroit, as chairman of the committee of malleable castings manufacturers having in charge the final details of a consolidation of prominent concerns in that industry, makes the announcement this week that the deal has been completed. For more than a year the negotiations have been under way, the prime mover in the project being John A. Penton, of Detroit, who has been secretary of the American Malleable Castings Association since its organization more than four years ago. The association had for its object the prevention of trade abuses, and the relations into which its members were brought make the step later taken toward consolidation a natural one. It is understood that the new company is formed on the most conservative lines, there being no cash paid and no underwriting, all the 17 concerns entering into it receiving stock for their plants and business. The auditing, which was a matter of months, was done by the well known New York firm of Jones, Caesar & Co.

The committee of manufacturers, the completion of whose work is now announced, was made up of the following: W. C. McMillan, Detroit; O. P. Letchworth, Buffalo; C. P. Botsford, Pittsburg Malleable Iron Co., Pittsburg; F. E. Nulsen, Missouri Malleable Iron Co., East St. Louis, Ill.; T. H. Simpson, Michigan Malleable Iron Co., Detroit; F. W. Sivyer, Northwestern Malleable Iron Co., Milwaukee; W. B. Ullman, Moline Malleable Iron Co., St. Charles, Ill.; B. H. Whiteley, Whiteley Malleable Castings Co., Muncie, Ind.

The concerns included in the consolidation are the following:

Albion Malleable Iron Co., Albion, Mich.
Beaver Dam Malleable Iron Co., Racine, Wis.
Belle City Malleable Iron Co., Racine, Wis.
Chicago Malleable Castings Co., West Pullman, Ill.
Chisholm & Moore Mfg. Co., Cleveland.
Marion Malleable Iron Works, Marion, Ind.
Michigan Malleable Iron Co., Detroit.
Misouri Malleable Iron Co., East St. Louis, Ill.
Moline Malleable Iron Co., St. Charles, Ill.
Northwestern Malleable Iron Co., Milwaukee, Wis.
Pittsburg Malleable Iron Co., Pittsburg.
Pratt & Letchworth Co., Buffalo, N. Y.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Springfield Malleable Iron Co., Springfield, O.
Trenton Malleable Iron Co., Trenton, N. J.
Waukesha Malleable Iron Co., Waukesha, Wis.
Whiteley Malleable Castings Co., Muncie, Ind.

The capitalization will be $20,000,000, equally divided between preferred and common stock. Of this amount $16,000,000 will be issued at once to the stockholders of the constituent companies. The combined output of the 17 companies is 200,000 tons of malleable castings a year, making the consolidation a very influential factor in the trade. It will be noticed that the concerns included represent with but one exception Western and Central Western plants. The principal concern outside in the Middle West is the National Malleable Casting Co., but it is not expected that its relations to the consolidation will be necessarily antagonistic.

A number of important consuming interests, particularly in railroad equipment and agricultural lines are to be represented in the organization of the new company. Another important connection is established by the participation in the new enterprise of Chairman E. H. Cary, Max Pam and associates, of the United States Steel Corporation. In respect to personnel, plan of organization, possible economies and outlet for product, the new company is in an exceptionally strong position.

Officers have not been elected as yet, but a meeting will be held at New York within a week or ten days, at which the organization will be perfected. The financial headquarters will be in New York while the operating headquarters, for the present at least, will be in Chicago. Referring to the organization of the new company Wm. C. McMillan said in an interview at Detroit:

"There has been no cash paid out and there is no water for stock jobbing purposes. We have combined because we believe it is for our best interest to do so, and have not sold out to any trust. It is true that United States Steel Corporation interests are in this. The new combination is as big as the National, the only other large malleable amalgamation in existence, and I consider it fully as strong. None of the plants will be shut down, and there will be no change in their management."

THE IRON TRADE REVIEW

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THE OUTLOOK FOR RAIL CONSUMPTION.

An examination of the statistics of rail production and the building of new railroad track shows that the rail trade is now on an entirely different basis from that of fifteen years ago, and that the outlook for heavy production in the future is very bright.

Until 1899, the banner year for rail production in the United States was 1887. It required just twelve years to catch up to the record made in 1887, for the reason that the early high mark was made under the heavy demand for new track. In those days renewals were not of great importance, the bulk of the production going into new track. The production of steel rails in 1887 amounted to 2,101,904 gross tons, while there were about 13,000 miles of new railroad constructed in that year. As the average weight of rails at that time was certainly not over 70 pounds to the yard, the old standard of 60 pounds being still much in vogue, it is evident that the great bulk of the 1887 rail production went into new track. In fact, if the 1887 rail production had all been in 70-pound rails, it would have laid 19,100 miles of single track.

In 1901 the conditions were diametrically opposite. The production of 2,936,273 tons, if in 85-pound rails, would have laid just 21,234 miles of track. According to Poor's statistics for last year the actual net increase in railroad mileage was only 4,453 miles, indicating quite plainly that the great bulk of last year's rail production went into the replacement of old rails.

At the present time the total of railroad track in the United States, including railroad and private sidings, etc., is about 275,000 miles. To replace this with 85-pound rails would require nearly 37,000,000 tons, or to replace one-fifteenth of it each year would require close to two and a half million tons of rails annually, outside of all rails required for new track.

That the present railroad track will have to have its rails replaced oftener than once in 15 years is practically without question. Present conditions are entirely different in railroading from those of not many years back. The weight of cars and locomotives has been increased in vastly greater ratio than the rail section. Speeds have increased, which increases wear and impact on the end of the rail, and a much larger number of trains pass a given point in a day, this being due not simply to the railroads having more business to do, but to the introduction of better means of controlling trains and the use of entirely automatic signals, whereby trains can be run much closer together. With all these factors pulling in one direction the life of a rail must necessarily come down.

Again, the heavy section rails of the present day have not the same life per pound as the old rails. In 1887, 60 pounds was the standard section and very few exceeded 80 pounds. The steel was worked and finished at a much lower temperature, and had a physical structure which gave the rails greater durability. There is no arraignment of the rail mills in this statement; the modern rail mill which has slightly deteriorated the wearing quality of steel rails has greatly decreased the cost. The average cost of the rails laid in 1887 was about $37 a ton, while the average price of Bessemer pig iron at Pittsburg in that year was $21. With Bessemer pig iron now slightly above the 1887 figure for forward delivery, the railroads are nevertheless getting their rails for $9 a ton less. This decrease in the spread is brought about in large part by the changes in methods of rolling. If the railroads are willing to pay the same advance for rails over pig iron that they did in 1887 the rail mills can doubtless give them a vastly better rail than was made in 1887. The probabilities are, however, that railroads will prefer cheap rails, and from the figures we have cited it is evident that rail production, merely for renewal purposes, should in the future exceed 3,000,000 tons every year, unless in years in which railroad managers allow their properties to depreciate, such depreciation to be made up in succeeding years.

THE DRIFT IN MACHINE SHOP PRACTICE.

The more obvious trend of machine shop practice is in the higher duty of tool steel, greater range and quickened action of positive feeds, and the multiplication of cutting tools. These are indeed the most spectacular in current machine tool improvements, and therefore attract the greater amount of study. There are other features of modern machine shop management, however, that in a quiet way are making for greater efficiency. It is well known, for example, that cutters for milling the teeth of spur gears are made on a compromise system for the different pitches. Each cutter is theoretically correct for a gear having a certain number of teeth, but in practice the one cutter is employed for cutting several gears, closely related in number of teeth and having the same pitch. The greater the variation in number of teeth from the theoretically perfect gear, the nearer the gear approached the range assigned to the next cutter in the series, the purpose being to have a sufficient number of cutters to prevent the inevitable inaccuracy being beyond a practicable amount. The demands of the trade have called for half pitches, and cutters are now made regularly to fill these requirements and still further reduce the tooth error. A number of shops whose work is of such a type that gears are manufactured in quantities have cut the knot of the difficulty by sets of special cutters made for the requisite number of teeth. The expense is a weighty item but the action of the gears is considered to be so much more satisfactory as fully to warrant the outlay.

The lighting of shops has also introduced special features of interest that call for a special article to treat them at fair length. The shop of the future may be illuminated by diffused light which will render obsolete the reflector and the direct artificial aid to seeing which are so trying to the sight. Whatever may be the outcome of the study of the problem as a whole, there is one feature which occasionally, never too often, receives attention. The lights about machinery are usually fixed, while the cutting tool is frequently movable and a change in the position of the latter involves a corresponding adjustment of the light. The workman sometimes meets the requirements temporarily by attaching the incandescent lamp with a piece of wire to the tool post, a procedure which leads frequently to the destruction of the bulb when the attachment is for the

moment forgotten and the cord becomes entangled with the belt shifter or some other obstruction. One manager on a large lathe has mounted the incandescent lights where they will bear directly upon the cutting tools and then by means of trolleys obtains the current from a pair of bare wires running the length of the machine. This is a neat and permanent device which may be employed in many similar positions to advantage.

The slow action of a forming tool—or perhaps it would be more nearly correct to say the slow rotation of a piece while being formed—is an obstacle to the rapid drilling of the work at the same time. Connections are sometimes made with the headstock spindle and a drill in the turret by a shaft parallel to the former so that the drill may be given a rotation in an opposite direction to that of the main spindle, and thus the drilling proceeds at the desired cutting speed, while the forming is also in progress at the proper rate. Another manager who has had to meet this situation extends an upright shaft from the turret to the countershaft and by means of an extra pair of pulleys at the upper end of the connection and a pair of bevel gears at the lower end, drives the drill at an increased speed. The arrangement is easily disconnected when the machine is to be used for other work.

Another feature which is doubtless destined to have much greater vogue is the use of the press. The rolled screw is not likely for the present to oust the thread cut product in general use, but in cash register work and for similar purposes the rolled thread screw is making progress, while the use of this method of thread manufacture is accepted for rough bolts and screws of the carriage making type. Rolling and pressing metals to the shape of studs, bolts, handles, balls and the like will be found to receive more attention in the future, particularly with an increase in the cost of material. The tough surface of a pressed blank compares well with the product carved from a solid bar of the same material and the function of the cutting machine may be limited to the shaving of the piece to size and finish. The cutting of big chips is not in itself so commendable a shop practice as the speedy reduction of the piece to size with equal celerity and at less waste of material.

The introduction of improved cost systems, pattern records, etc., has already received detailed attention in *The Iron Trade Review* and as a live subject of management will receive further treatment in the coming year. At this time it is unnecessary to do more than point out the growing importance of this question and its marked influence upon the profit making side of the machine shop. One of the less obtrusive adjuncts to the modern plant, it is really the most important, and the increased amount of care given to the subject shows an enlarged machine-making efficiency, at least a fair equivalent to the work of improved tool steels and other more conspicuous conveniences.

A number of changes in the management of the Demmler plant of the American Tin Plate Co., McKeesport, Pa., went into effect this week. William C. Lloyd, who has been manager of the plant, goes to New Kensington, Pa., to take charge of the company's plants at that place, and William Richards, who has been manager of the New Kensington mills has taken Mr. Lloyd's position at Demmler. George Crawford, superintendent of the Demmler plant, has resigned to accept the position of general superintendent of the ten tin mills under erection by the McKeesport Tin Plate Co., McKeesport, Pa. He has been succeeded by Dudley Pitcock, who has been night superintendent of the Demmler mills.

The demand of members of the Pattern Makers' League employed in the ten jobbing shops in Cincinnati did not result in the threatened strike. The manufacturers put their case in the hands of the National Metal Trades Association and posted at their shops the association's declaration of principles. The pattern makers asked for a minimum of thirty-seven and one-half cents and complete unionizing of shops with perpetual agreement. The demands were not granted and shops which formerly were practically union are now open.

PERSONAL

F. C. Kidney, secretary of the Standard Malleable Iron Co., Muskegon, Mich., has resigned. W. H. Mann will succeed him and F. Livingston has been appointed assistant secretary.

Thomas F. Griffin, of Corrigan, McKinney & Co., is confined to his home in Cleveland by a severe attack of pneumonia. As soon as his strength will admit, he will go to Texas or New Mexico to spend the winter.

Samuel W. Griffith has been appointed assistant purchasing agent of the Lorain Steel Co., Johnstown, Pa., to succeed George P. Suppes.

Vice President John J. Quinn, of the Ninth district of the Amalgamated Association of Iron and Steel Workers has resigned. His district comprises the plants in the St. Louis district. John Edwards, of Granite City, Ill., has been appointed his successor.

William H. Banfield, superintendent of the plants of the American Tin Plate Co. in Ohio has resigned owing to ill health. Berthold Goldsmith succeeds Mr. Banfield.

Thomas J. Edwards, general manager of the furnaces of the Williamson Iron Co., Birmingham, Ala., was burned to death on Wednesday, Nov. 26, in an explosion at one of the furnaces.

Andrew Carnegie is recovering from the illness that prostrated him at London on the eve of his departure for the United States. He will probably sail for New York in the coming week and remain in this country until May when he will go to London to deliver his address as president of the Iron and Steel Institute.

S. V. Huber, consulting engineer, of Pittsburg, returned this week from his recent European trip. While abroad Mr. Huber spent most of his time in Germany, including ten days at the Düsseldorf Exposition. In speaking of the exposition, Mr. Huber said he was astonished at the strides made by the German machinery manufacturers. The exposition was especially notable for the showing of rolling mill machinery. Whole roll trains, for both rails and merchant material, were shown in operation, though no steel was actually rolled. There were also two universal mills in action, and there was a greater variety of machines than I ever saw at any previous exposition. Of especial interest were a number of the newest types of gas blowing engines. These are designed to use the gas that comes from the blast furnaces and great economies are possible. There were also some very large hoisting engines for mines and pumping machinery, both steam and electrically driven. To add to the effectiveness of the gas blowing engines, gas washers have been constructed, of which several types were shown. These extract the dust from the gas as it comes from the blast furnace and prevent the gas engines from becoming choked up. The German and French manufacturers are devoting a great deal of attention to producing gas engines of high power. Many of them are building single engines of 1,000 and 1,200 horsepower. In the construction of machine tools, the advance of the German manufacturers has been especially notable. At the present time many of the English steel plants and machine shops are being remodeled after the newest German plants."

A meeting of the stockholders of the Union Steel Co., the recent consolidation of the Sharon and Union Steel companies' interests, was held at Pittsburg, Dec. 1. The merger was not completed, however, for the reason that much work remains to be done in taking inventories of the properties of the two interests. It is now stated that it is not probable that the consolidation can be completed until after the first of the year. It has been decided to erect 200 bee hive ovens immediately in the lower Connellsville region, the product to be used by the new furnaces to be erected at Donora, Pa. J. D. Brennen has been appointed superintendent of the plant.

It is reported from Waukesha, Wis., that Armour & Co. have become interested in the sheet steel mills there, and will furnish capital for the establishment of a plant for making tin in connection with it.

The Machinery and Metal Working Trades—News Letters from Selling Centers.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
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The machinery market in this locality during November, was marked by a slight falling off in trade. There is, however, no disposition to complain of present conditions, as the slack trade is usually attributed to the ordinary causes prevailing at the close of the year which check sales. Not one manufacturer interviewed took a pessimistic view. In machine tools, the month was perhaps more barren of large orders, than any month of the present year. The largest buyer was the General Electric Co., which gave out some good orders for new equipment for its shops at Schenectady, N. Y. These were fairly well distributed. It was expected that the International Steam Pump Co. would give out orders for the machine tools it intends to install at the Snow Steam Pump Co.'s plant at Buffalo, N. Y., but it has not done so up to this writing. The equipment will amount to about $200,000. The railroads, as usual, made some good purchases of machine tools during the month, generally of one or two tools at a time.

Makers of electrical machinery have been doing an unusually good business recently, chiefly due to manufacturing establishments putting in complete lighting plants, and to machine shops installing motor driven tools.

Manufacturers of special machinery report trade conditions to be excellent. Outside of builders of electrical machinery they seem to be the only ones who have not detected some let-up in trade.

An interesting feature of the month is the impetus which the export trade enjoyed. We hear of more orders coming from this source during the past month than for any month of the year. The explanation given is, that trade having slackened here, manufacturers gave a little more attention to foreign business than they have for months past.

Deliveries are now better than they have been in sometime. Many houses state that they are now in position to promise shipments almost as desired, particularly for small machine tools. In deliveries of large tools some improvement is noted also, but still some complaint is heard. As a result of better deliveries, store houses now contain more equipment than could be seen for at least six months past.

Although many good judges expected that when trade became anyway dull the prices of machine tools would recede from advances made in them several months ago, we have not heard of any general reductions being made It is claimed here that as long as present prices of raw material continue, nothing in this direction can be expected. One prominent manufacturer is authority for the statement that some makers of drills show a desire to ease their prices, but no general information to this effect is going the rounds.

Considerable gossip was heard during the month as to the outlook for trade next year, and all of it was of the most hopeful kind. Everywhere the assurance is given that there is good business in sight. Traveling salesmen's reports are all to this effect. Those who speak optimistically of the new year, expect the railroads to be heavier buyers of machine tools next year than they have been this year. Others speak of industrial establishments in process of formation, which will be heard from in the purchase of machinery. The only large order that the new year will positively furnish, is for the equipment of the new shops of Henry R. Worthington, at Harrison, N. J., and which will form an outlay of about $500,000.

While their machine tool business for November was not as large as that done by them during October, the Niles-Bement-Pond Co., of No. 136 Liberty St., booked some very large orders in traveling cranes, the most notable being for two 40-ton cranes from the Norfolk & Western Railroad Co., for installation in one of its shops. Another large order for burning and turning mills came from the General Electric Co., for its shops in Schenectady, N. Y. The company is now installing $60,000 worth of cranes in the shops of the Snow Steam Pump Co., Buffalo, N. Y.

Although the scheme to consolidate the leading builders of cranes is still under way, we are informed by one in a position to know, that it "is further from completion than it ever was."

The Sprague Electric Co., of No. 527-531 West Thirty-fourth St., did a large business during November. Orders of note received by them were as follows: Twenty 200-k. w. turbine generators, three 75-k. w. generators, and four 20-k. w. generators, the De Laval Steam Turbine Co., Trenton, N. J.; one 200-k. w. engine type generator, the Otis Elevator Co., Yonkers, N. Y.; two electric hoists, Phoenix Iron Works, Phoenixville, Pa.; one electric hoist, Landes Tool Co., Geiser Station, Pa.; one electric hoist, Pond Machinery & Tool Co., Plainfield, N. J., and one electric hoist, the Scranton Supply & Machinery Co., Scranton, Pa.

The Stanley Rule & Level Co., of Hartford, Conn., will soon equip its plant in that city with new machinery.

The M. H. Treadwell Co., of No. 95 Liberty St., has received an order for twenty 20-ton hot metal cars from the Lackawanna Steel Co. The cars will be built entirely of steel, and will be similar in construction, but of greater size than those illustrated and described in *The Iron Trade Review* of July 10 last. John R. Morgan, formerly chief engineer of the Morgan Engineering Co., of Alliance, Ohio, is now chief engineer of this company, and is stationed at its works at Lebanon, Pa. The company's crane business has grown greatly recently, and Mr. Morgan will give it his particular attention in the future. The company's business in this vicinity has necessitated another addition to its New York offices.

Paul Bigelow, of No. 39 Cortlandt St., representing the Buckeye Engine Co., has received an order for one 450 horse power engine, and one 200 horse power engine from the J. J. Rogers Co., of Au Sable Falls, N. Y., and an order for one 125-h. p. engine from the Bernhard-Meiner's Co., Brooklyn, N. Y.

Olney & Warren, of No. 36 Dey St., have received some good sized orders for steam engines, boilers, and wood-working machinery from Cuba recently, and particularly from Puerto Rico.

Mayer & Co., Inc., of No. 39 Cortlandt St., manufacturers of steam boilers, report that orders now-a-days are all for small units, with some good business "hanging fire."

CHICAGO AND THE WEST.

OFFICE OF *The Iron Trade Review*,
934 MONADNOCK BLOCK, Dec. 2.

The reports received from machinery manufacturers during the past month show no dimunition in the volume of trade; on the contrary, there is confident hope that the coming year will see a greater growth than the year drawing to a close. The most conspicuous feature of the month's reports is the large increase in orders from foreign countries. The demand is for all kinds of steam power equipment, from a 3-h. p. gasoline engine to the heavy type of Corliss engines. The Charles A. Stickney Co., of St. Paul, Minn., has orders pending for 2,000 3-h. p. gasoline engines for export. The Gardner Governor Co. has orders on its books for air compressors and pumping machinery for Belgium, Mexico and Great Britain, and has made shipments to Russia, France, Australia and Mexico. Charles H. Besly & Co., Chicago, have shipped

two Gardner grinders to Austria during the month; Fisher Governor Co., Marshalltown, five governors to Berlin, Germany. Holthoff Machinery Co., Cudahy, Wis., has made shipments of mining machinery to Scotland, Mexico and South America; and the Hawley Down Draft Furnace Co., Chicago, shipments of Schwartz melting and refining furnaces to Siberia, England, Russia, France and Germany. Preparations are being made by many concerns for extensions to plant in the coming spring, many having already placed orders for the necessary equipment to insure its delivery. Few firms are keeping pace with the demand for their machines, and owing to the uncertainty in the delivery of crude and finished iron and steel, deliveries are made more remote. We give below the substance of a large number of reports received:

Charles H. Besly & Co., Chicago, have shipped during the month under review, a large number of Gardner grinders to all parts of the country, two machines going to a manuafcturer in Austria. The company is also experiencing a good demand for its motor-driven, direct-connected grinder, orders being very plentiful. It expects to occupy its new store building January 1, 1903. This will give the firm larger facilities for handling its growing business.

George Whiting Co., Chicago, manufacturer of punches and shears, reports business during the last month very satisfactory. In the last week the firm closed orders for quite a number of machines, and has several live contracts pending which it expects will be closed in a few days. The prospects point to a continued large business, to meet which the company contemplates increasing the capacity of its plant. No difficulty is experienced in securing prompt payments for machines sold, money seeming to be plentiful. A few weeks ago the company placed on the market a new quick acting punch, which was described in *The Iron Trade Review* of Nov. 20. It is now developing a combined belt power and punch, for which several orders have already been received, together with many inquiries. This machine, the manufacturers say, reduces the cost of riveting by doing the work faster than methods in vogue. Another new tool which the company is bringing out is an improved type of rotary shears for cutting plates and sheet steel of different thicknesses and widths.

Fisher Governor Co., Marshalltown, Ia., manufacturer of steam pump governors, has had the best trade during the year just closing, of any in its history. Up to September 1 last, it did more business than during the entire previous year, which in itself was a banner year. Its export trade is increasing steadily, shipments of five Fisher governors having been made to Berlin, Germany, during the month. Other shipments of governors were made during the month, to the American Steel & Wire Co., Joliet and De Kalb, Ill.; Bettendorf Axle Co., Davenport, Ia.; Colorado Fuel & Iron Co., Pueblo, Col.; Cincinnati Cooperage Co., Cincinnati, O.; Natchez Hotel, Natchez, Miss.; Waco Gas Co., Waco, Tex.; the French China Co., Sebring,O.; Pittsburg Steel Co., Monessen, Pa.; Shreeve & Co., Wilmington, N. C.; Palestine Coal & Mining Co., Tucker, Tex.

George Gorton Machine Co., Racine, Wis., manufacturer of grinding machines, will build a new machine shop and power plant early in the coming spring, which will be either slow burning construction or fire proof. The company will be in the market for power plant consisting of engine and direct connected generator, also for a few electrically driven machine tools.

Joseph T. Ryerson & Son, Chicago, reports no abatement in the demand for machinery; in fact, pneumatic tools, hydraulic machinery, boiler and bridge shop equipment are in greater demand than at any previous time, while in minor tools new business is so plentiful that deliveries have become very remote. The company anticipates a greater volume of business in 1903 than in the present year.

Northern Electrical Mfg. Co., Madison, Wis., manufacturer of direct and alternating current power transmission machinery, reports that its business for October was the largest in the history of the company; that each month for the past year has brought it more and more business, necessitating extensions to its plant. It recently completed one addition to its shops, of 100 feet, and is completing two others, each 100 feet long, one 90 feet and the other 50 feet wide. Further extensions are contemplated next year, should the volume of business warrant them. It reports that the general character of business received is first class; that payments are made promptly, and that it sees no indication of weakness anywhere. Its export trade is good, shipments abroad being regularly made.

Lennox Machine Co., Marshalltown, Ia., has made shipments of beveling and splitting shears within the past month to the Atlantic Refining Co., Point Breeze, Philadelphia; Remmeli Dawley Mfg. Co., St. Louis; Stirling Co., Barberton, O.; Carroll-Porter Boiler Co., Pittsburg; Chandler & Taylor Co., Indianapolis, Ind.; Francis Smith Co., San Francisco, Cal. It reports that the present year has been the most successful one in its history, orders for beveling and splitting shears being 50 percent greater than in any preceding year. The company is in the market for a machine for making tin ells for its furnace department.

Bignall & Keeler Mfg. Co., Edwardsville, Ill., says there is no decrease in the volume of business, orders being plentiful for pipe threading and cutting machines, vises, etc.

Gardner Governor Co., Quincy, Ill., manufacturer of pumping machinery, air compressors, etc., has had a brisk demand for its line of machinery in the past six months, the capacity of its plant having been taxed to the utmost in making deliveries on time. It reports a substantial increase in its foreign business, shipments having been made recently to Russia, France, Australia and Mexico, with unfilled orders on the books for Belgium, Mexico and Great Britain. It finds the outlook promising, and sees nothing to indicate any decrease.

Stephens-Adamson Mfg. Co., Aurora, Ill., manufacturer of elevating, conveying and power transmitting machinery, has a large amount of work on hand and plenty in prospect. It has recently completed a three-story brick addition, the second floor of which will be used for general offices and the engineering department. Among recent shipments of machinery by this company are the following: Illinois Sewing Machine Co., Rockford, Ill., rope drives, shafting, etc.; H. D. Corlies, Rantoul, Ill., complete grain elevator outfit; American Malting Co., Chicago, rope drives, shafting, bearings, etc.; Steel Elevator & Storage Co., Nashville, complete belt conveyor equipment, including carriers, pulleys, bearings, etc.; Illinois Central Railway Co. (for Fulton, Ky., plant), one carload transmission machinery, rope, sheaves, tension carriages, shafting, bearings, etc.; Itta Bena Cotton Oil Co., Itta Bena, Miss., one carload shafting, pulleys, couplings, clutches and hangers for complete oil mill plant; German-American Portland Cement Co., LaSalle, Ill., four belt conveyors complete, including standard mounted carriers, take-ups, "S-A" conveyor belt, with ¼-inch cover, shafting, etc.; besides large shipments to the Southern Pacific Railway Co., Galveston, Tex.; Marquette Cement Mfg. Co., LaSalle, Ill.; Buckeye Cotton Oil Co., to its plants in Selma, Ala., Macon, Ga., and Augusta, Ga.

Charles A. Stickney Co., St. Paul, manufacturer of gas and gasoline engines, reports negotiations pending for 2,000 farm engines for export. Five months ago the company placed on the market a three-horsepower engine for farmers' use, and since that time has had an extraordinary demand for it. Extensions to the plant have been necessary in the period that has elapsed since this engine was put on the market, and further additions are contemplated.

The Vilter Mfg. Co., builder of refrigerating and ice making machinery, Corliss engines, brewers' and bottlers' machinery, Milwaukee, Wis., has recently closed engine contracts with the following: Gutman & Co., Chicago (second order), 24x42 Corliss engine; Wausau Paper Mills, Brokaw, Wis., tandem compound, 15x30x42 Corliss engine; Louisiana Central Lumber Co., Clarks, La., 24x48 Corliss engine; Wm. Henning, vinegar works, Chicago, 14x30 Corliss engine; Lamar Light & Water Co., Lamar, Mo., 16x30 Corliss engine; City Water & Light Department, Fort At-

kinson, Wis., 18x36 Corliss engine; Ewart Building, Chicago, 20x42 Corliss engine; Warner Starch Co., Waukegan, Ill., twin 28x48 Corliss engine; Hilgen Mfg. Co., Cedarburg, Wis., 20x42 Corliss engine; Rock Island Sash & Door Works, Rock Island, Ill., 30x48 Corliss engine; American Candy Co., Milwaukee, Wis.; 18x36 Corliss engine; Boland & Gschwind Co., Ltd., New Orleans, La., one 20x42, one 17x42, and one 22x42 Corliss engine.

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Dec. 3.

Most favorable business conditions are indicated by conversations with and letters received from manufacturers and dealers. There is, however, some complaint on two subjects, the high cost of materials and the difficulty in getting prompt service from the railroads. One manufacturer writes: "The greatest difficulty we are having at the present time is the question of freights. It seems almost impossible to obtain delivery of material from 100 miles distant or more, in less than two or three weeks. We have been most seriously handicapped by this for the last two months and instead of getting better the situation is gradually growing worse all the time. It will be necessary, if general business conditions remain good through the winter, for the railroad companies to take aggressive action toward the relief of the condition at the present most serious, which will in the opinion of the writer gradually grow worse, as the winter season is always provocative of delay in transportation, more so than any other period, and the present conditions in all branches of business demand prompt service."

It was to be expected that when the foundrymen advanced prices of castings to conform to the high prices of pig iron and fuel, there would be some disposition to object on the part of manufacturers. This feeling is expressed by one, who writes us as follows: "We find it a little hard to secure business at much profit on account of the prices being so very high on iron and steel, coal and other products entering into our manufacture. We are paying as high as $80 a ton for castings and a few of them cost $60 a ton, very few of them less than that, and it makes all finished products very high in price and we have been compelled to put the price so high that people do not like to buy. For instance—on a machine that we formerly sold at $25, we are compelled now to charge $40 and do not make at the present time as much profit as we did formerly on $25. If we put the price any higher we will hardly sell at all and we find that it is so all along our line. Prices of finished product are too high to meet with ready sale. We feel sure that the top limit is reached and if prices advance further it will mean less sales. We must not forget that one-half of the people in the United States are still farmers engaged in agricultural work, and that the advance in their product is not in proportion to the advance in finished product such as machines, etc., of which they must be largely the purchasers."

The Upson Nut Co. reports that it is very busy on orders.

The Chisholm & Moore Mfg. Co. is receiving many orders for chain hoists and also for products of the malleable department. Business with this company is in a most flourishing condition and it is confident that conditions will not change for some time.

The Vulcanus Forging Co. is so busy that, with the completion of its electric light plant, three shifts will be run.

The C. O. Bartlett & Snow Co. reports that it has plenty of orders and is running overtime. One of its specialties is the manufacture of dryers for drying coal, sand and gravel, and the demand for this line has been very urgent; in fact, the company has not been up with orders for the last year.

The Brown Hoisting Machinery Co. has closed a contract with the Union Steel Co. to install at the South Sharon works a conveying plant for the unloading and handling of ores for three blast furnaces.

The Ohio Motor Car Co., of Cleveland, recently incorporated under the laws of Ohio, has been organized for the purpose of conducting a general automobile, storage and repair business. It has secured the State agency for the Northern Runabout manufactured by the Northern Mfg. Co., of Detroit, and the county agency for the Toledo touring car, manufactured by the International Motor Car Co., of Toledo. The office and salesrooms will be located at 317-319 Huron street after Jan. 1.

The Acme Machinery Co. sees nothing in its business to warrant any unfavorable conclusion as to change in business conditions, which are stable without any evidence of becoming feverish or, on the other hand, of waning.

The Cleveland Pneumatic Tool Co. reports that business is improving every month. It has all it can possibly do in its present shop and expects to move into its new factory about Dec. 15, after which it will be able to serve customers much more promptly. The company has recently sold to the American Locomotive Co., Schenectady, N. Y., and Pittsburg, Pa.; Newport News Shipbuilding & Dry Dock Co., Newport News, Va.; Buffalo, Rochester & Pittsburg R. R. Co.; St. Louis & San Francisco R. R. Co.; Michigan Central R. R. Co.; St. Paul, Minneapolis & Omaha R. R. Co.; Warren City Boiler Co., Warren, O.; A. F. Bartlett & Co., Saginaw, Mich., and a large number of other plants, all as the result of competitive tests.

The Standard Welding Co. reports that demand for all classes of material that it manufactures has been in the last three months and is now exceedingly good.

The Van Dorn-Elliott Electric Co. has recently added to its plant a large amount of new special machinery for making commutators and commutator bars. Commutator building is becoming a most important branch of this company's business and it has found it necessary to increase its facilities to meet the demand.

The Cleveland Punch & Shear Works Co. finds that there is at least as much activity in the machinery business in its line as there has been at any time during the past two years. It anticipates that the volume of business for next year will be fully as large as during the past year and probably greater.

The Ajax Elevator & Machine Co. reports that business is excellent. It has contracts on hand for all elevators that can be turned out in the next six months by the present plant, but the company is getting in a number of new machines which will enable it to get out work more rapidly. It has at present two men on erecting work in New York and is finding a market throughout the East and West for its machinery.

Foote, Burt & Co. report that November was a remarkably good month and that they see no signs of let-up. They are increasing their capacity by installing new tools and cannot get work out as fast as they would like to do.

The Chase Machine Co. reports its shops still crowded with work. It has recently acquired a strip of land in the rear of the blacksmith shop, giving an entrance through from Center St., in addition to present frontage on Elm and Main Sts. The company is shipping this week an automatic steam towing machine to the Newport News Ship Yard, weighing over thirteen tons, being destined to tow log rafts on the Pacific Ocean.

The Reade Machinery Co. has purchased five acres in Collinwood between the Browning Engineering Co. and Bronson-Walton Co., where it expects to erect a warehouse in the near future. The company has not yet fully decided what further buildings it will put up. It expects to operate a machine shop and to put in a complete equipment for the repair and handling of heavier classes of machinery, such as locomotives, Corliss engines and heavy machine tools. The company reports that there has been the usual steady demand during November for punches and shears and an unusually strong demand, the latter part of the month, for the heavier class of machines.

The Champion Safety Lock Co. has purchased the plant of Knapp & Pratt at Geneva, O., which has been used in manufacturing kitchen hardware. The Champion Co. will convert the plant into a lock manufactory. The plant consists of one large three-story building and several smaller structures.

In spite of the agitation for reciprocity with Cuba, in-

volving reduction of the tariff on sugar, the erection of new beet sugar plants will proceed in several States and the Kilby Mfg. Co. will get its share of the business. This company has recently made three important contracts for building the machinery for plants as follows: At Fort Collins, Col., plant of capacity of 1,200 tons of beets per day; at Owosso, Mich., plant of 1,000 tons; and at Windsor, Col., plant of 600 tons.

CINCINNATI.

Dec. 2.

November was a generally satisfactory month in the machinery trade. Orders were good and business is reported as in highly encouraging condition as to outlook. The same confidence is shown right along and more improvements and extensions of plants are being arranged for. Foreign trade runs along about the same. Some machine tool makers report a fair business in this line, others comparatively little. Shops are running to capacity and some overtime.

The Bickford Drill & Tool Co., is running until 9 o'clock at night. They report orders heavy, with an urgent demand from railroad shops. They have a new edition of their catalogue now in press which will be ready for distribution by Jan. 1.

The R. K. LeBlond Machine Tool Co., is building a $4,000 one story brick shipping room, 80x100 feet on the east side of Eastern Ave., south of Beechmont St.

The American Tool Works Co. has found it necessary to add to its capacity and has closed a deal for additional buildings in the immediate neighborhood, on Eggleston Ave. and running through to Culvert St., just below Fifth. This property was acquired to relieve the crowded condition of the shops. The company is now bringing through a new 18-inch American lathe, having features which are decided departures in the lathe construction. The new lathe will be on the market before the first of the year.

The McIlvaine & Spiegel Boiler & Tank Co. is negotiating for a large order for boilers for the water works at San Antonio, Tex. It includes three 250-h. p. corrugated flue boilers Clyde type. This company has placed its order for 13 motors to be used in the reconstructed shops, with the Cincinnati Electric Motor Co.

The American Laundry Machinery Co. reports a fairly good foreign business. Orders are coming mainly from Australia and Germany. The company is arranging to move into its new plant at Norwood some time this month. The shafting and hangers are now being put in.

The Cincinnati Machine Tool Co. has a good steady run of orders. The company has closed a nice month's business and notes an improvement in foreign orders, mainly from France.

Schumacher & Boye have found it necessary to increase their plant and have purchased 180x200 feet of ground on Spring Grove Ave., running back to Buck St. They will erect a brick structure and will remove their general offices to the new building.

It is reported that the principal owners of stock in the Cincinnati Traction Co. are arranging to organize a new company for the construction of street cars. The Cincinnati Traction Co. car shops at Chester Park will probably be enlarged and used by the new company and the present working force of 500 men will, it is said, be increased to about 2,000. The property at Chester Park will be sublet and the Traction company will pay for all cars built there. It is expected that the new shops will also furnish cars for the Widener-Elkins syndicate which comprises street-car systems in New York City, Philadelphia, Pittsburg, Washington, Indianapolis, Chicago and elsewhere. The tangible property at Chester Park is now being invoiced and valued preparatory to the flotation of the new company.

M. L. Andrew & Co. are contemplating a large new plant, as they have outgrown their present accommodations. They have three sites under consideration. It is necessary to have more room in view of the large increase in orders for heavy machinery. They have orders now in hand to keep them busy until next April. This concern is now building a large multiple iron drilling machine to drill twenty-one 13-16 holes in steel. The machine will weigh from 18,000 to 20,000 pounds and will take in 22 feet between centers of outside spindles. This is believed to be the largest machine of this kind ever built. The bearings are all made of carbonized phosphor bronze, the gear of both phosphor bronze and crucible steel.

George C. Keene & Co., manufacturers of cornice and roofing machinery have just built a new plant at 2327 Florence. Ave. The new shops include a main building 30x88 feet, in which the heavy erecting and finishing work is done, and a 11-ton traveling crane for the handling of large castings. The machine shop measures 60x80 feet. The power is supplied by a 20-h. p. Watkins gas engine. Among the orders in course of production and recently shipped by the company are the following: A large 10-foot double corrugating machine for the New York Iron Roofing & Corrugating Co., of Jersey City, N. J.; two 10-foot corrugating rolls for the Philadelphia plant of the Wheeling Corrugating Co.; an entire outfit for the Kentucky Iron Roofing & Corrugating Co., at Covington, Ky.; and a complete outfit for the new plant of the Wheeling Roofing & Cornice Co., of New Martinsville, W. Va.

PHILADELPHIA.

Dec. 2.

A decided falling off in the volume of business in this market is noticeable. The fact, however, is not very remarkable; indeed it would seem strange if a lull did not come at this time. A decline in demand is a customary feature of the market in the closing weeks of the year.

Dealers are deferring their orders until the opening of the new year, anticipating similar action on the part of consumers. The same conditions have prevailed at this season in previous years, therefore nobody is entertaining the thought that the decline is anything more than temporary. The fact that inquiry is as active as ever is evidence, if any is needed, that consumers' requirements are as heavy as at any time previously, and good buying will no doubt be resumed after the turn of the year.

A great deal of machinery left the builders' shops during November, shipments in the aggregate being almost as heavy as during October, which was probably the best billing month of the year. A round of the different shops shows that much machinery remains uncompleted, owing to the impossibility of obtaining different materials entering into its construction. Much complaint is heard in regard to the delivery of steel castings. The supply of these is wretchedly deficient and there would appear to be plenty of business assured for one or two additional steel foundries. It is rumored that an attempt is being made to organize another steel casting concern to be located at Chester, and the promoters are said to be John T. Dickson, formerly connected with the Penn Steel Casting & Machine Co., of Chester, Pa., and William S. Logan. The capital is to be $250,000 and it is proposed to purchase a site and erect and equip a plant capable of handling all kinds of general work.

Foreign trade continues exceedingly poor, and the prospects for its betterment do not appear particularly bright. So much attention has been given to domestic requirements that little effort has been made to secure foreign customers. The inquiry from abroad has been light for some time, and shows no improvement whatever from the local standpoint.

At the Bourse the agents for the different machinery builders report a fair business for November, but quite a falling off in comparison with the October business. New comers to the machinery department are Quigley & Krastin, of Woodbury, N. J., makers of automatic chucks, automatic collapsing taps and automatic self-opening dies. They have taken quarters in Section X and their products will be pushed from this branch. They are meeting with great success in the introduction of their tools, and are establishing some good agencies.

The Tioga Steel & Forge Works, Ltd., are now occupy-

ing their new plant at 52nd St. and Gray's Ave. Included in the plant is a large machine shop for finishing up shafts, cranks, and other machinery parts. They are now able to undertake the heaviest work, both in forging and finishing. The plant is being operated day and night on orders.

Collections are in very good shape, obligations being well met.

The Newton Machine Tool Works are very busy. In point of shipments November was a very busy month with them. Among the different tools leaving the works was a 30-foot gear cutter for Nutthall & Co., Pittsburg, Pa., said to be the largest machine of its kind ever built. They have just secured several properties adjoining their works and will proceed to extend their buildings. With the newly acquired property they will have a frontage on Vine St. of 400 feet, as against 200 feet now. The other boundaries will be 23rd St., Pearl St., and 24th St. Plans are being prepared for the new buildings which will be steel structures, three stories high on one side, open in the center and in the Pearl St. bay. They will install a 30-ton electric crane in the main building, and another of 10 tons capacity in the Pearl St. bay, besides several smaller cranes, all travelers. They will themselves build most of the new shop tool equipment required, but will enter the market for a large planer and a number of lathes.

The Hess Machine Works, builders of file-making machinery, are quite busy. They have had a great deal of foreign business in their shops of late, recent shipments covering machines for Great Britain, France, Germany, Switzerland, and for the Imperial Government of Japan.

Israel H. Johnson, Jr. & Co., builders of lathes, report a fair month's business for November with numerous shipments covering mostly small to medium sized tools. Among the largest machines shipped were two 36-inch lathes with long beds and two sets of carriages for the Bethlehem Steel Co., Bethlehem, Pa.

The Espen-Lucas Machine Works continue very busy on their specialties, which are cold saw cutting off machines and saw grinders. They say they are making numerous shipments and their type of machines is meeting with much favor.

The Eynon-Evans Mfg. Co., manufacturer of engineers' specialties, has about completed the extensions to its works, but has not yet closed for the additional equipment required. Air compressors, pneumatic tools, and shears are to be installed, with possibly a new engine and boilers.

Edwin Harrington, Son & Co., machine tool builders, have considerable business in hand, and state that the influx of both orders and inquiries is satisfactory.

The Falkenau-Sinclair Machine Co., builders of testing machines, presses, and special machinery and tools, say business is quite good with them. They are just making another large shipment of motors to the Union Motor Truck Co., Philadelphia. They recently shipped a large special No. 5 double crank press to parties in Ohio, and have two large hydraulic presses about ready for shipment to the American Locomotive Works, Schenectady, N. Y. A number of standard presses were shipped during the month just closed, and they state that taken altogether November was a better month with them than several preceding.

The Tabor Mfg. Co., builder of molding machines, reports another heavy month's business. The monster molding machine the company has been engaged on for some time for the Bethlehem Steel Co., has been placed in position at the works of that company, and is about ready for trial. Considerable interest attaches to the starting up of this machine, as it is the largest molding machine ever built, and works 9 feet in the clear. Among the numerous orders recently booked, this company mentions one from the American Locomotive Works for a 16x26 and a 20x30 machine for the Schenectady, N. Y., plant; a 13x20 machine for the Dunkirk, N. Y., plant; and a 16x26 machine for the Pittsburg plant. Other machines shipped include one to the Atlantic Brass Co., New York; a 13x18 machine to the McNab & Harlin Co., Paterson, N. J.; a vibrator frame machine to Taylor & Co., Brooklyn, N. Y.; two 14x16 machines to the Walworth Mfg. Co., Boston; a 13x18 machine to the Crosby Steam Gauge & Valve Co., Boston; an 18x22 machine to the Geo. V. Cresson Co., Philadelphia; a vibrator frame machine to the United States Steel Co., West Everett, Mass.; a vibrator frame machine to the General Electric Co., Lynn, Mass.; a similar machine to the Glamorgan Pipe & Casting Co., Lynchburg, Va.; and another to the Benj; Atha Co., Newark, N. J. Several machines were shipped to Great Britain, among them two 13x20 machines to Cameron & Roberts, Kirkintilloch, Scotland; a 13x20 machine to Jones & Foster, Birmingham; a 14x16 machine to the Brittannia Foundry, Coventry; a 24-in. square machine to Darlington; and a 14x16 machine to Alex. Forbes, Dublin, Ireland. The company has also just booked an order from the Rensselaer Mfg. Co., Cohoes, N. Y., for an 18x30 machine.

The Keystone Machine Tool Works, builders of cold saw cutting off machines and machine tools, report business good with them, both orders and inquiries coming in nicely.

The Franklin Machine Works are busily engaged on orders for their line of tools, including boring machines, cold saws and saw grinders. Orders are coming in satisfactorily, and inquiries are voluminous.

The Pusey & Jones Co., of Wilmington, Del., have captured an order from Sweden for paper mill machinery amounting to upward of $100,000; and the Harlan & Hollingsworth plant of the United States Shipbuilding Co., Wilmington, has been awarded the contract for a $150,000 steam yacht for A. Cary Smith, of New York.

To record activity at the Baldwin Locomotive Works would be continuing a story likely to run for years. Orders at this plant have been so prolific that new orders for deliveries in less than a year are being turned down. Even with a force of 13,000 employes and a system strained to the utmost, the full capacity of the plant has been reached, and, it seems, passed. The orders of the Pennsylvania Railroad recently reported, 350 engines, would alone run the plant for some time; and with the orders reported or made public a little idea as to the magnitude of the work in hand can be gained. Baldwin's, however, do not make public all the orders they book, therefore it may be assumed that public estimates as to the condition of business at the works are sadly "out." The plant has gradually been extended until now it has pushed into what was once considered a first-class residence section, and further extensions are still sought. As might be expected, the company is meeting with considerable opposition from property owners, but the advancement goes on nevertheless. The most recent orders booked for speedy delivery, and these were taken on options given some time ago, include 45 locomotives for the Philadelphia & Reading Railroad; 25 for the Southern Railroad; and 25 for the Norfolk & Western Railroad.

The Advance in Iron and Steel Freight Rates.

(Special Telegram.)

PITTSBURG, Dec. 3.—The iron committee of the Central Freight Association at a meeting just held has determined on an advance of 10 percent in the rates on iron and iron products, to become effective at once. During the navigation season this class of freight is rated as fifth and sixth classes, and at its close the custom has been to advance to the fourth and fifth classes. The advance just ordered will give a freight below the normal winter rate. A prominent traffic manager states that it is the intention to leave the regular class rates undisturbed, but to make a horizontal raise on all those articles which now enjoy a special rate below the regular class rate. This will remove many of the inconvenient commodity tariffs.

Howard M. Hooker, who has been the Pittsburg sales agent for Rogers, Brown & Co. for a number of years, with offices in the Park Building, has tendered his resignation, effective on Jan. 1. He has organized a company to be known as Howard M. Hooker & Co., with a capitalization of $125,000. They will deal in pig iron and coke, a specialty to be made of high grade irons for roll making purposes and all foundry grades. Temporary offices will be established at 321 Park Building, but upon the completion of the Farmers' National Bank Building, Fifth Ave. and Wood St., offices will be established on the seventh floor of that building.

A SUIT OVER BLAST FURNACE FLUE DUST.

The equity case commenced against the Jones & Laughlin Steel Co., of Pittsburg, Pa., by residents of the Oakland district, Pittsburg, who claim that flue dust from the Eliza blast furnace plant of the company on Second Avenue is depreciating the value of their property, was tried last week. A number of residents of this district testified that flue dust from the furnace had the effect of killing all kinds of shrubbery and that the dust permeates everything in this prominent resident district. It was explained that these showers of dust were greatest immediately following a slip in the furnaces. Prof. F. C. Aschman, a chemist, who was placed on the stand for the plaintiffs, testified that samples of the dust showed 75 per cent of iron ore.

John B. Miles, one of the contractors who built the furnaces, testified that they were equal to any in the country, and while he had heard of appliances which would prevent the escape of this dust, he did not consider them practical for the reason that it would not be safe to confine the gases that cause the slips. He added that the pressure of the slips is affected by the material used and that it is higher by reason of the fine ore that is being used to charge the Eliza stacks. Charles McCreery, formerly superintendent of the Duquesne furnaces of the Carnegie Steel Co., was an expert witness on behalf of the defendants. He testified that so far as he knew there was no method by which the escape of this flue dust could be prevented as long as fine ore was charged into the furnace. Mr. Burrows, a chemist, testified to having visited the Iroquois furnace plant at South Chicago, where one of the Kennedy furnace tops is on one of the stacks, and after watching the stack for three hours could see no benefit from the use of this top. Julian Kennedy was called to the stand by the plaintiffs in rebuttal and testified that one of his tops is on one of the Iroquois furnaces and another on one of the Isabella stacks, Pittsburg, operated by the American Steel Hoop Co., and that they are very successful. By his appliance he said that no flue dust escapes from the furnaces and that the system has a tendency to carry the dust down instead of up. The hearing was here concluded. No decision has yet been rendered.

This case is being watched with a great deal of interest, not only by the property owners in the Oakland district, but by blast furnace experts throughout the country. Since the use of large percentages of fine ores has been made almost compulsory by certain iron and steel interests, owing to their small holdings of hard ores, much trouble has been experienced in the operation of furnaces, the fine ore having a tendency to cause slips and the resulting explosions often doing considerable damage. That some means must be devised to use this fine ore with a minimum of risk and loss is apparent to all blast furnace operators, but from the testimony at this hearing it is evident that the experts who testified are by no means a unit as to the question of remedies.

Recent sales of Dravo, Doyle & Co., 815 Lewis Block, Pittsburg, include the following: One 12,000-h. p. Cochrane feed water heater and purifier, of special construction, for blooming mill of the Union Steel Co., Donora, Pa.; two 16x14 direct connected Ball engines, for the Pittsburg Spring & Steel Co.; one 11x18x16 tandem compound Ball engine and one 1,000-h. p. Cochrane feed water heater and purifier for the Cleveland Worsted Co.; one 750-h. p. Cochrane feed water heater and purifier for the Fremont-Yaryan Co., Fremont, O.; one 500-h. p. Cochrane feed water heater to the Franklin Rolling Mill & Foundry Co., Franklin, Pa.; one 1,500-h. p. Cochrane feed water heater and purifier for the Elyria Iron & Steel Co., Elyria, O.; two 60-inch x 16-foot Union Iron Works boilers to the Naomi Coal Co., Naomi, Pa.; one 200-h. p. Union Iron Works boiler to the New Kensington Brewing Co., also one 450-h. p. Sorge-Cochrane system of feed water heating and purifying; one 60-h. p. Union Iron Works locomotive type boilers, for the U. S. Government, Pittsburg; one 600-h. p. Cochrane feed water heater and purifier for the Philipsburg Fire Brick Works, Philipsburg, Pa.; one 5,000-h. p. Cochrane feed water heater and purifier, to Jones & Laughlins Steel Co., Pittsburg; one 3,000-h. p. Cochrane feed water heater and purifier to the Superior Iron & Steel Co., Sault Ste. Marie, Ont.; one 9½x10 Ball engine to the Diebolt Brewing Co., Cleveland, O., and one 12x12 Ball engine for the Bijou Theater building, Pittsburg.

The Lowe Retort Coke Ovens.

An experimental retort coke oven plant which the Jones & Laughlin Steel Co. is erecting on Second Ave., Pittsburg, near the Eliza blast furnace plant will be given its first test shortly. The plant will consist of 25 ovens and will have a daily output of 100 tons. The ovens are after the design of Prof. Lowe, of California, and differ from other retort plants in that no effort is made to save any of the by-products except the generated gases. If the test proves successful the gases will be used for heating purposes in the rolling mills and there is a possibility of their use in blowing engines for the furnace plant. It is the intention to place a contract for an extensive plant in case the test is successful.

The various district sales agents of the Jones & Laughlin Steel Co., of Pittsburg, were entertained by the officials of that company on Monday and Tuesday, Nov. 24 and 25, at Pittsburg. On Monday they were taken up the Monongahela River in the company's tow boat Vesta as far as Lock No. 3, and on Tuesday the company's plants were visited. The affair wound up with a smoker at the Pittsburg Club on Tuesday evening. The visiting representatives present were: H. F. Holloway, New York; D. M. Barker, Chicago; F. A. Goodrich, St. Louis, Mo.; J. C. McLauchlan, Detroit, Mich.; G. C. Beals, Buffalo; John B. Newkirk, Philadelphia; W. F. Bonnell and F. A. Pope, Cleveland; A. B. Marble, Boston; George Kinsey, Cincinnati, O.

Stack No. 2 of the Empire Iron & Steel Co., Reading, Pa., which was out of blast since last June owing to the scarcity of fuel has been blown in. No. 1 stack was lighted last week. The Topton furnace operated by the same company will be placed in operation as soon as improvements under way can be completed. The Keystone, Temple and Emaus furnaces in this district are securing large quantities of coke and as the supply of anthracite is also coming in no further trouble from the fuel scarcity is anticipated. Leesport furnace was blown in this week and within the next two weeks all the furnaces in the Lebanon, Schuylkill and Lehigh valleys will be in operation.

The Cumberland Foundry & Machine Co., Cumberland, Md., recently incorporated, was formed to operate the foundry formerly operated by a partnership known by the same name. It is an entirely new concern, the old firm having dissolved and gone out of business. The company does not contemplate making any changes in the foundry or machine shop at present. It will make all kinds of iron and brass castings.

On December 5 the Carnegie Steel Co. will blow in new Furnace J at the Edgar Thomson plant at Braddock, Pa. The erection of this furnace was done in record breaking time, ground having been broken only last spring. When it was proposed to some of the large furnace building concerns that they erect this stack in the time specified, none would undertake the task on account of the scarcity of material. The Carnegie Steel Co. then undertook the work itself with the result that a new record in furnace erection has been made. The companion furnace now under construction, which will be known as furnace K will be completed early in January, while the stack under erection at the Carrie plant, Rankin, Pa., will not be completed until March.

The Sharon Coal & Limestone Co., a subsidiary company of the Sharon Steel Co., has increased its capital from $200,000 to $300,000.

A Spur Gear Planer of Universal Size.

The R. D. Nuttall Co., of Pittsburg, has intalled a machine for planing the teeth of large spur gears by the use of a single pointed tool and templets. The machine is of unusual capacity and presents new and interesting features. The action of the tool is similar to that employed in some of the bevel gear shapers but it is an original application of the principle to the production of spur gears inasmuch as the gears are placed on the machine in a horizontal position instead of perpendicular as on other machines. The machine is shown in Fig. 1 as it appears in the R. D. Nuttall Co.'s plant and Fig. 2 is a reproduction of a photograph taken while the machine was on the floor of the erecting shop of the builders, the Newton Machine Tool Works, of Philadelphia. As seen in position at the Pittsburg plant the top of the dividing table is nearly flush with the shop floor and most of the indexing mechanism is below the floor line. The other view in Fig. 2 will better illustrate the connection between the motor and the different parts of the machinery.

The gear lying flat upon the dividing table is accurately spaced around by the dividing mechanism shown at the left of the cut in Fig. 2, and the teeth are shaped to templets by a tool carried in the vertical slotter. This slotter has a stroke of five feet and is driven by a spiral gear connected to the bevel gearing shown on the countershaft. The countershaft itself is driven by a motor enclosed within the column. The vertical column can be moved in and out to any desired position on the extension bed and will readily accommodate gears up to 30 feet in diameter. If a greater capacity is required, the bed

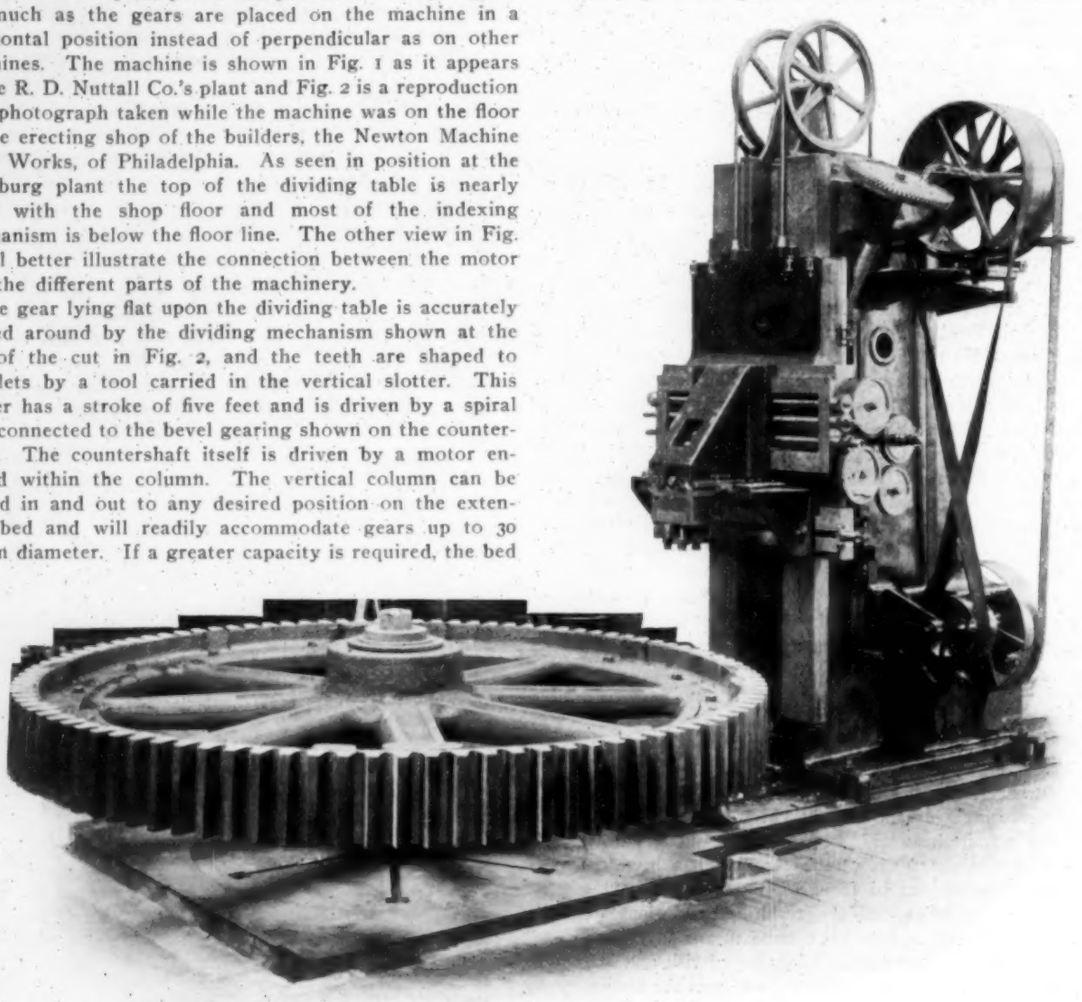


FIG. 1.—THE SPUR GEAR PLANER AT WORK IN THE PLANT OF THE R. D. NUTTALL CO.

may be extended indefinitely to take any size of gear.

Figs. 3 and 4 show sections through the tool apron, or saddle, and the mechanism by which the tool is fed. The pins A, as the saddle is raised and lowered, engage with the teeth of the star wheel B. During the upward stroke no motion is produced, owing to the star wheel working on a ratchet, but immediately the saddle descends, the pin gear, operating through the feed gears, causes the screw C to rotate and thereby feed the apron across the face of the column. With the feed gears D and E, shown in Fig. 4, in use, the apron would be fed to the right, but if these are removed and the combination shown in Fig. 3 substituted, the introduction of the extra gear F causes the apron to be fed to the left. Upon either side of the apron are the steel points G G, Fig. 5, and as the carriage is fed to one side or the other, these points come in contact with the templets which are held in the holders H H. This constrains the movement of the tool to conform with the contour of the templet. As the rotation of the star wheel would have a tendency to feed the apron farther than the templet allows, a friction clutch, 1 in Fig. 6 on the star wheel shaft allows the feed to slip as soon as the point G touches the templet.

While the head is being fed crosswise, the tappet J, Fig. 4, striking against the top of the lug K, rotates the gears L M and N, and then through the train of bevel gears O, in Fig. 3, the screw P is revolved, thus feeding the tool up to the work. A hinge and spring mechanism on the toolpost allows the tool to spring downward on the return of the upward stroke. A section through the dividing table is shown in Fig. 7. This table is, in effect, the upper side of a large worm gear which is driven by a worm on the shaft P. Fig. 8 illustrates the indexing mechanism for rotating this table.

The operation of the machine is as follows: The motor having been started, the plunger Q, Fig. 8, is raised by means of the lever R and this leaves the gear S free to rotate. The friction lever T is now thrown over, putting the friction clutch in gear, and the worm wheel S then turns until checked at the end of a complete rotation by the plunger Q, which has by this time reached its former position at the bottom of the slot, thus preventing further movement of the wheel S. The friction clutch then slips and the action is brought to rest. Motion is transmitted from the worm S to the work shaft P through the intermediate gears U and V, the size of which are varied to give any desired divisions to the revolution of the gear that is being cut.

When completed, this machine was tested by means of a transit placed on the dividing head. This was sighted on a point about 40 feet distant so as to multiply the error, which proved to be almost imperceptible, and consequently negligible for all practical purposes.

QUESTIONS ON FOUNDRY COST-KEEPING.

The article on "A System of Foundry Cost-Keeping," which appeared in *The Iron Trade Review* for August 7, the Machinery Issue, was reprinted in the *Foundry* of the succeeding month and received some criticism. The two letters which followed the publication of the article in questions are appended in the order as they appear in the issues of the *Foundry* for October and November. The first is by Benjamin Thompson:

A Criticism by Mr. Thompson.

I have been much interested in the article describing "A System of Foundry Cost-Keeping." The cost of castings is a subject in which nearly every foundryman is interested and naturally the methods adopted by his competitors to determine what this cost is, receives more than ordinary attention.

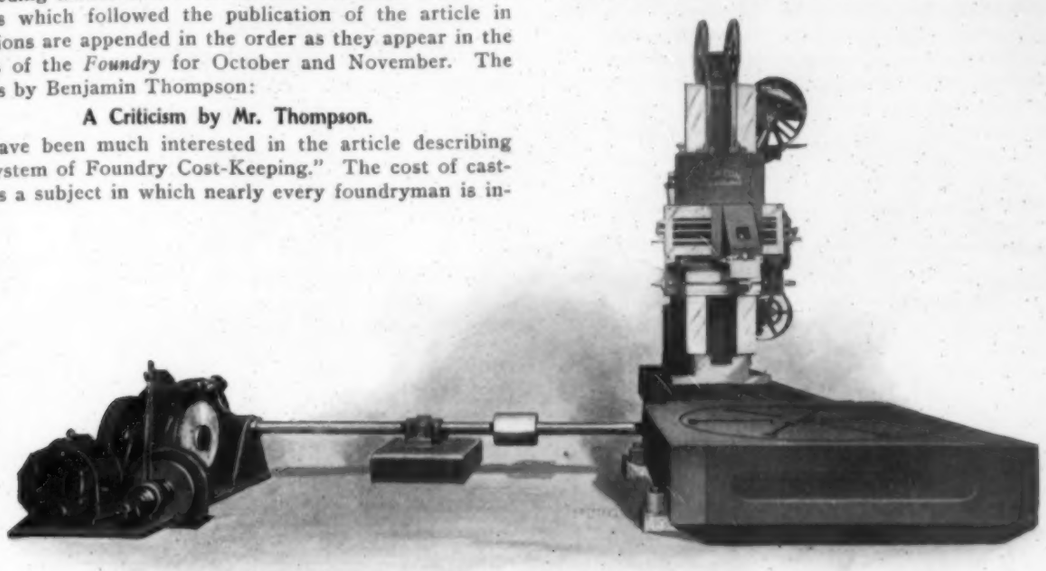


FIG. 2.—THE PLANER ON THE ERECTING FLOOR OF THE BUILDERS.

The actual cost of castings is what a foundryman wants to know. It is really immaterial to him what others set aside for superintendence, insurance, depreciation, etc., because all of these items are known to him as far as his own establishment is concerned, and if not are easily ascertained. In a general way it may be said to be practically impossible to find the exact cost of every little casting which enters a jobbing foundry. While S. F. claims through a card system to be able to ascertain the labor cost of all castings weighing from one-half pound upwards, it is certain that this can not be done except in specialty shops, where the question of shop costs is relatively much easier to handle than it is in a foundry accepting contracts for all classes of castings. That Mr. S. F. does not make many half-pound castings is shown in Fig. 7, where the average weight of castings is shown to be 335 pounds.

If a molder could work on every jobbing casting singly it would be possible to say just what the labor expended thereon amounted to, but as we all know, small patterns in a jobbing shop, the half-pound variety which S. F. mentions, also sometimes called chicken feed, are not handed out singly to the molder nor are they always patterns belonging to the same party. With this class of castings the molder is given as many patterns as he can conveniently handle in one flask, and it is evidently out of the question to say what has been the exact value of the labor expended upon each, no matter what kind of a system one may follow.

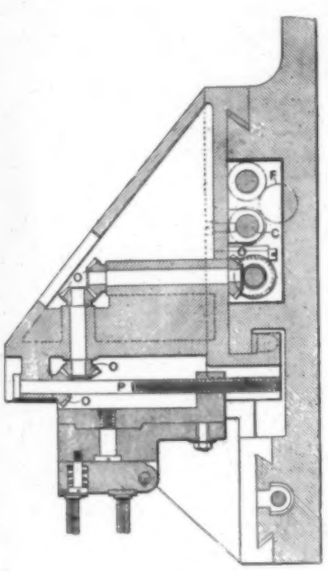


FIG. 3.—SECTION THROUGH SADDLE.

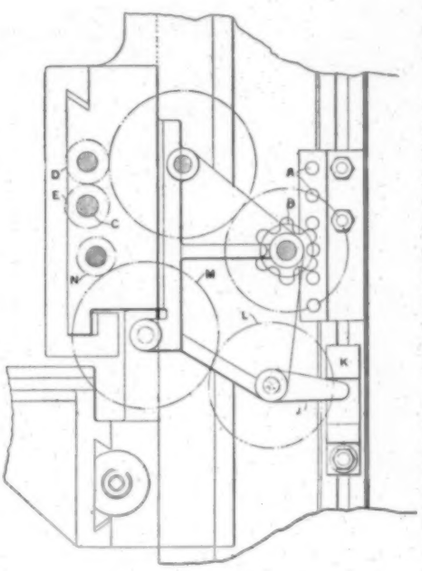


FIG. 4.—FEED MECHANISM.

For the lighter class of castings the foundryman will find it more convenient to divide these into sections, such as very light bench work, light cored castings, plain uncored castings, etc., and then ascertain the cost per pound of producing each class instead of trying to find the cost of each individual casting, something he can not do in the ordinary jobbing foundry. We all know that it is easy enough to figure out the length of time which has been spent upon a large casting, the rub comes in when one tries to figure out the cost of the smaller castings after the same fashion. Evidently S. F. only intended the system he describes to apply to the heavier class of castings far beyond the half-pound limit as he says a clerk is sent around to each molder to collect information as to how the time has been occupied by the molder and his helper. This clerk is also to obtain the actual number of hours' work that has been done on a certain job by coremakers, cleaners and chippers. It is plain that unless the casting is one of considerable size the molders and other workmen can not remember the time spent on every little job until the clerk appears to make a note thereof.

It is asking too much of a set of workmen to carry around in their heads the exact time spent on every little casting. The object sought may be partly accomplished by furnishing molders, coremakers and casting cleaners with daily time reports to be filled in by them as they

reach one job after another throughout the day, but then in that case it is unnecessary to have a clerk trying to obtain the same information as this can be copied from the reports of each workman.

I do not believe that it is the custom of foundrymen to consider one cent per pound as covering the cost of melted iron outside of the fuel consumed. I do not see how this price can be arbitrarily fixed at this figure when one considers the fluctuations in the cost of pig iron and fuel. If we desire to obtain the actual cost of castings there can be no such a thing as considering this item a fixed charge. Of course any foundryman is at liberty to charge what he pleases for his castings, but what I am trying to show is that the system illustrated does not give anywhere near a true statement of the actual cost of producing castings. Mr. S. F. gives the "actual" cost of producing a cylinder top, or what he probably means, a cylinder bead, weighing 9,000 pounds, as being $177.50. Bunching up his figures in a different form I find that he has charged to metal $90.00, labor $29.50, and superintendence and other items $58.00. I believe every practical foundryman will support me in saying that in a well regulated foundry the cost of superintendence, sea coal, sand, etc., is not double the amount expended for labor. In other words, Mr. S. F. allows 32.7 per cent for general shop charges when he only allows the total cost of molders, their helpers, coremakers and cleaners 16.6 per cent. From actual contact with foundries I know that contracts for castings are taken within much narrower limits.

This particular cylinder head which is used as an illustration must also have been a most complicated casting since it required three days of the coremakers' time when it only took the molder four days and a half to make the mold, set the cores and cast it. The shop could also not have been using a very good grade of blacking since the chipper worked two days to get it into a fit shape to leave the works.

I object most emphatically against Mr. S. F.'s method of charging up the loss caused by rejected castings. The actual loss sustained by a foundryman when a casting is defective is the cost of molding and coremaking, the expense of melting the iron together with the loss of metal in the melting operation, the general shop expense attached to the casting and the cost of breaking up the casting so that it may be remelted. It is the extreme height of absurdity to claim a loss equal to the price at which the casting would have been sold as shown in Fig. 2 of the cost system illustrated for does not the foundryman retain in his possession the iron of which the casting was made?

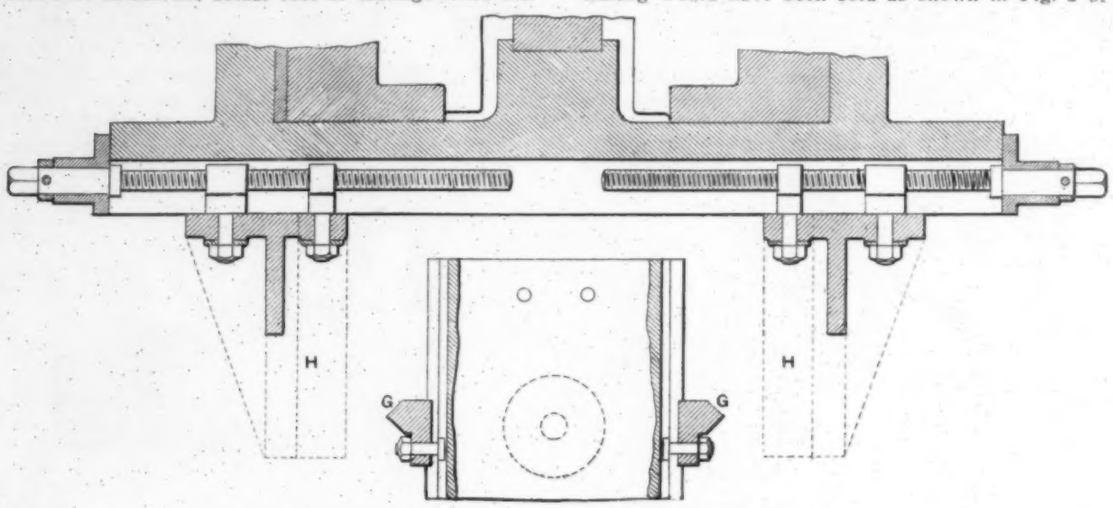


FIG. 5.—SECTION THROUGH GUIDES AND TEMPLET HOLDERS.

I do not know whether the blanks shown in the article have been filled in with the idea of doing this just for the fun there was in it, at any rate if any one has a cost system that amounts to anything the less joking there is about it the better the foundryman will like it, as this is not much of a subject to joke about. From the cupola record of Mr. S. F. I take it that on June 10th of this year he melted a heat consisting of two charges of 6,500 pounds each. On the bed consisting of 500 pounds of coal and 350 pounds of coke he melted 6,500 pounds of iron and on the following charge of fuel consisting of 100 pounds of coal and 300 pounds of coke he melted another 6,500 pounds of iron or at the ratio of 1 to 16.25. I am not much of a believer in melting ratios, for generally the man who doesn't care much for what he says can melt the most iron with the least fuel, at the same time to save S. F. the trouble of substantiating these figures with actual facts, vouched for by responsible parties, I should like to have him admit that the ratio which he quotes is simply a joke, or say a dream.

The semi-annual report shown in Fig. 7 may be so complete that it answers all demands, at the same time I am of the opinion that what the majority of foundries are after in the way of a cost system is not something which will inform them twice a year what their foundry expenses amount to, but rather something which will enable them

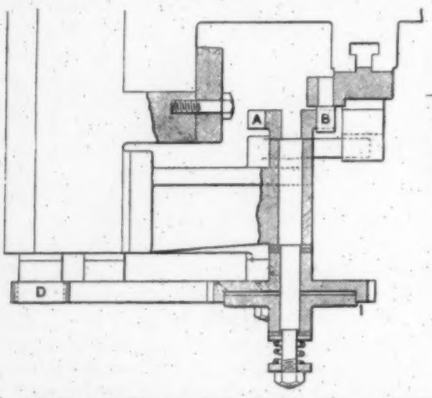


FIG. 6.—SECTION THROUGH STAR WHEEL AND FRICTION CLUTCH.

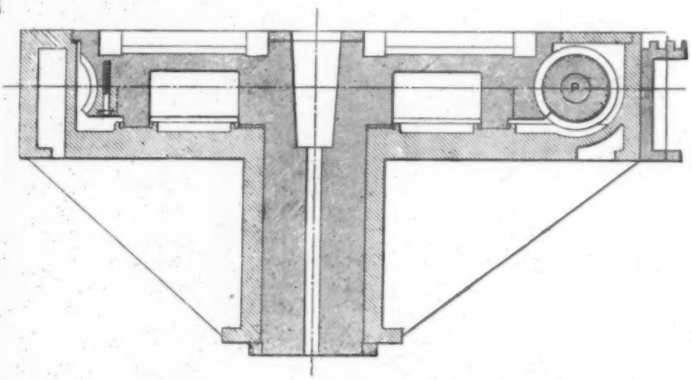


FIG. 7.—SECTION THROUGH DIVIDING TABLE.

to say what it has cost them to fill a certain order for castings. This the system of S. F. fails to do, and while he may have made a pretty good *guess* at the cost of producing castings, still nothing is surer than that before he shows us how to arrive at the *actual* cost of castings he will have another guess coming.

An Answer by S. F.

I notice in the October issue of the *Foundry* that Benjamin Thompson condemns the system of cost-keeping illustrated by me in a preceding issue. As he seems to have failed to understand this system, I will endeavor to enlighten him as best I can. Taking up the points as they appear in Mr. Thompson's article, he believes that it is practically impossible to obtain the exact cost of small castings made in a jobbing foundry, although he does not state the reasons why this should be the case. Instead he favors the idea of dividing castings into different sections according to their general character, thinking that it would be more convenient for the foundryman to ascertain the cost of producing each class instead of attempting to find the cost of each individual casting. It is my opinion that the cost of each individual casting can be readily located. Let a molder make as many small castings in a day as he pleases and when the time-keeper calls for the molder's time I can see nothing to hinder him from giving the time he has spent on each pattern, according to his best judgment, which is the only way that a molder can account for what he has accomplished during the day, and is equal to any time slip the molder might fill out himself. After the exact time on each pattern has been obtained, the accurate labor cost for the molding can be had on each casting by dividing the total cost by the number of castings made. The same system can be followed in ascertaining the cost for cleaning and core making, and when one knows what is the actual cost per pound for melted iron and all the other expenses incidentally to operate in the foundry, I know that it is easy to get at the accurate cost of each casting, weighing as low as one-half a pound apiece, as it is with castings weighing 20 tons.

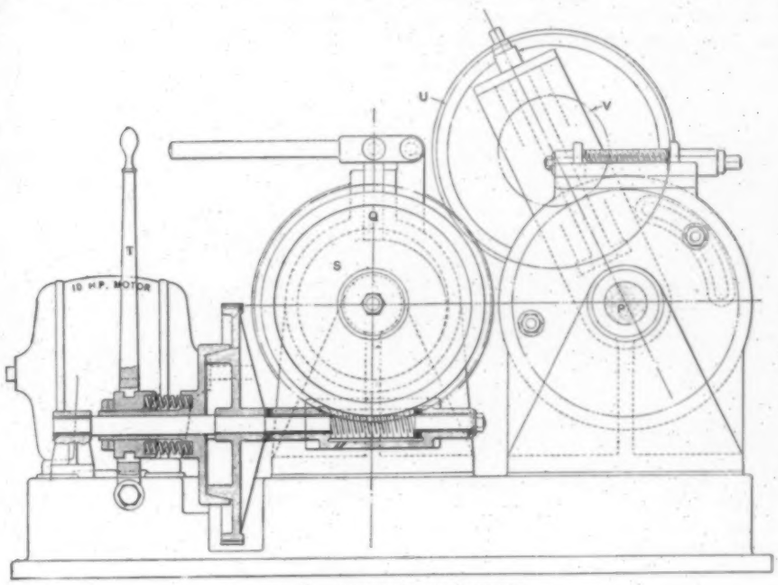


FIG. 8.—INDEXING MECHANISM.

In regard to the cost of melted iron I would say that at the time the article was written, pig iron was worth from $18 to $20 per ton, scrap iron, $13, and coke and coal was much lower than it is at the present time. The cost of our melted iron at that time came within the one cent limit and in addition I would also say that this item does not include any of the expenses connected with operating the cupolas, as in the system we follow, this is taken care of under the head of non producers and general expenses. It is, of course, granted that it costs the same to melt iron for light castings as it does for the heavier class of work.

Referring to the criticism as to the relative cost of molding as compared to other expenses I believe that every foundryman knows that on the class of castings mentioned, molding, core making and cleaning castings are by far the smallest items in their cost. In my former article I gave the actual average cost per pound and notice that Mr. Thompson puts considerable emphasis on the fact that labor only amounts to 16 per cent against 32 per cent for expenses. I will explain that the cost of a casting must be figured this way in order to insure no loss to the foundryman and yet not overcharge the customer. Taking a casting, such as is described in the original article, and it requires exactly five days from the time the job is started until the casting is in the cleaning room. This casting must stand its share of all expenses according to its weight and cost of labor to produce. The expenses of a foundry are very high each day, and include rent, taxes, insurance, light, heat, power and wear and tear on everything inside the foundry, together with expenses for repairs and salaries for such non producers as manager, superintendent, foreman, and other persons, who draw pay in one position or another. Then the material in the foundry is not to be found on the dump, but must be bought and paid for, which causes the foundryman to charge for this on his cost card for each casting.

I believe every foundryman is familiar with the supplies required in the foundry and by careful figuring for years of all these different items, we find that the system explained in my former article is the only one which will give us the average cost for any class of castings made.

I do not understand why Mr. Thompson objects to the system of charging the rejected casting at the price at which it would have been sold, as I believe this system is very just. If the casting had been good and had been delivered the foundryman would certainly have received the full price, which would be greater than the actual cost to produce it. All we have left is scrap iron which is to be broken up again and go through more handling than if the casting had been a good one. Taking account of everything, one-half cent per pound is about all one would expect as credit, and this we get in the yard report, as all foundry scrap is charged into the cupola without taking account of it the second time. Its value may, if it is so desired, be fixed at an arbitrary figure as it belongs to the shop and is home made scrap. Now on the other hand, if the casting had been good and delivered to the customer the foundryman would have received for this casting at least one cent per pound more than the actual cost charged to the foreman, which in this case would make a loss of $90.00 to the foundryman and no less to any one else.

In regard to the melting ratio quoted, if Mr. Thompson will figure up the whole heat he will find that this is only 1 to 10.4, which, I believe, any foundryman could easily attain. Mr. Thompson also overlooks the fact that in addition to the semi-annual report shown, we also have weekly reports giving the cost of producing castings in complete form, as does also the monthly report shown in connection with the system. In this way we are able to get at the cost of each casting made, as we have the individual cost cards and from these the reports are made, which makes the system as accurate as it is possible to have one in any foundry. I still believe that the system I am working under is as good as any used in this country for foundry purposes. My idea in preparing an article on this subject was not to show any one what I could do in the way of producing castings or melting iron, but rather to give foundrymen a chance to become acquainted with the system under which I am working.

Certain Factors in American Supremacy in the Iron World.

BY G. L. F.

The present tone of industrial papers in the United States is so optimistic that one hesitates to follow them closely for fear of being guilty of schoolboy enthusiasms. On the other hand a too critical exposition is apt to consign the writer to the class of pessimists deservedly unpopular everywhere. It is patent to all that the high wages paid in the United States, even considering the high cost of living here, permit great savings for old age, and so the ambitious, and therefore desirable, emigrants, crowded out by congested population at home, come to the United States, North or South. The best go to Pittsburg, the greatest labor market in the world, and perform work there of an intensity and severity almost incredible in most labor centers. I have several works in mind where one man, usually a Slav or Hungarian—and each man in the department does as much—hauls on iron plates (not tracks) with an imperceptible down grade, a two-wheeled buggy weighing 800 pounds, and contents weighing 1,700 pounds—2,500 pounds in all, and no wondering comment have I ever heard expressed.

The same tense activity you will find prevailing in each department. At one plant, a 400-ton blast furnace, at the front they have on one turn only one hot blast man, a keeper, a helper, two cinder snappers and possibly a man to carry bars and mix clay. The stock yard may have a weighman, a hoist engineer and two men on the electric train, in unloading ore. And in the handling of cinder dump, in hauling molten metal to the mixer for open-hearth or converter, the same attention to apparently unworthy details will be found. This process of minimizing the number, rather than reducing wages, gives great control over, and efficiency in, those employed, producing a vertiable labor "corp d'élite."

The courage to tear out the old and introduce always the most modern and efficient, provided the appliance pays 25 percent on the investment, is a direct result of large profits and large future profits resulting from a high tariff. Whatever may be said of it from an ethical or political standpoint, high tariff means, with an ambitious people, industrial growth and ultimate supremacy. The Dominion Iron & Steel Co.'s plant at Cape Breton would probably never have been built were it not for the tariff and bonus inducement. They also quickly appreciated, as they had a poor labor market, that they must pay large wages, which they did.

The large opportunities permitted by the distribution of prizes and a relatively enlightened policy of giving credit where it is due, has stimulated each small department official to arrange his work so that as few unnecessary moves are made as possible. The captain or superintendent of the floating gang (mark that idea), who of course has lieutenants under him, in not a few cases gets $150 a month and sometime $250—a large price for an executive of shovel and pick and wheelbarrow.

The railroads may be something of a roulette wheel to stock investors. They were six years ago, but they are docile to iron plants, their great customers; and we read of a plant in Youngstown, O., shipping pig iron 600 miles by land and 3,000 miles by water to England's coast for $3.60 per ton, and so they and the tariff explain much. They can do this because on heavy tracks they can use heavy mogul engines (decapods and more), drawing heavy cars, heavily loaded—meaning low charges for crew and maintenance, per ton hauled.

We can then say next in extending this idea that "large divisors" are a strong influence in economical production. Large divisors are obtained by the sales agent accepting order with little or no profit rather than have a shut down; by the higher officials providing spares in machinery and seeing that a regular supply of ore, coke and stone are always to be had. The cost of overcoming the inertia of an idle plant is enormous and frequently inexcusable. Besides irregular wages mean disgruntled workmen and the loss of the most efficient. Idleness breeds discontent. Aside from any desire to enter the anthracite coal controversy, one cannot help thinking if those men were worked 313 days instead of 200 they would have less time to think of mischief and get into trouble. Even as great a man as Lord Brassey could not stand idleness. It takes education not to get into trouble with too much spare time.

The principle of "large divisors" is not only carried out in operations—where each moment the plant is not creating product and earning money is regarded as a reproach, but is applied in construction. The ladles, skip cars, bins, converters, open-hearths, and blast furnaces, are designed so that the number of men affecting and controlling a given operation will have their wages scattered over a large production. The shorter the distance and time between trains on a railroad, the less time the tracks are rusting without earning a dividend. The shorter the time between the thoughts and ideas of the heads of departments, the less they are being paid to smoke cigars in easy chairs. Time in which the rolls turn over, and no billets or blooms or rods or rails for them to work on, is time lost, is wealth squandered in unproductive outlay.

In one or two instances some have thought that the principle of large divisors has made units so large as to influence adversely metallurgical conditions, creating losses more than offsetting labor economies. In the construction of blast furnaces and open-hearth furnaces the economical limit by many is supposed in many instances to have been passed. But a verdict depends on the market. In dull times probably, yes; in good times the large units even in these instances some regard as best.

Large outputs are therefore very desirable, and while it can be carried too far are a large factor. They are assisted enormously by strong coke, pure flux and rich ores. The better these are, the more iron there is obtained for each cubic foot of wind delivered by the blowing engines to the furnace. We can accurately state that the returns on efforts in securing rich ores—as rich as the nature of the coke and shape of the furnace will permit—are better than on the same intelligence and effort exerted on the mechanical side of the plant. Pig iron in most processes can properly be regarded as a 93 or 94 percent ore and the concentration by coke from lean ores in the furnace is the most expensive method of concentration. Large outputs from the blast furnace also result from low silicons, as well as from good stock and machinery and organization (this is true also at the converter); so we should have the converter near the furnaces so that, as low silicon iron normally has low initial heat, there will be but slight skulling of the molten metal en route from furnaces to mill if transit is rapid. Put concisely, it might be said the proper place to run a blast furnace is at the mines; the converter should be run from the blast furnaces and the rolling mill from the converter—each department, being the seller or deliverer, is made a servant to whims and desires of buyer or receiver, i. e., the next step in the process of conversion or manufacture.

The direct process—carrying molten metal from furnaces to converter—is the outcome of having sufficient furnace units assembled near the converter to meet its appetite and is suggested by the uniformity of lake ores and their sensible mining into hard and fixed grades, permitting a regularity of quality of metal not dreamed of 15 years ago and even yet only obtained from four or five plants with unfailing uniformity. The advantages of the process are enormous. Besides saving the addition of sulphur and phosphorus to metal at the cupolas, the coke, stone and labor and repair cost of cupola maintenance is done away with, amounting at one plant to more than $200,000 yearly.

A few national personalities and traits are also large influences in our development. We are free from the pride of learning. The man with a very large reservoir of knowledge is apt to be thinking of how he can display what a large mental reach he has. This leads him frequently to attribute occult explanations to obviously patent causes of trouble. Again, many profound intellects

searching for scientific relations are prone to be afraid of their own conclusions, fearing some law or relation may have been overlooked; not appreciating that approximate truth is all we can hope to obtain in commercial life—that in minor matters one or two small mistakes in the quickly assembled industry are more than compensated for in early receipt of interest on the investment. Besides, the scientific temperament is accompanied by such an intense love of truth that the scientist is too apt to believe in the high motives of his subordinates. I have had many owners and men in authority observe to me that a good engineer was seldom a good manager, the latter being usually more of a business man.

Whether the water which has been infused into the stock of our industrials is justifiable is an open question. While it may mean in hard times deferred dividends, or no dividends, and disappointed stockholders and consequent subsidence of values to justifiable figures, the large amount of money thus made available engenders a courage in outlay hardly possible in more conservative, less enthusiastic —I had almost said more honest—financing. These mental attitudes and conditions largely explain our power, and without them even our wonderful resources would be somewhat negatived. It is the atmosphere of courage, vitality and energy, and frequently wastefulness—products of youth. The reins of affairs are in the hands of youth. So it is not to the originating or discovering of new processes or relations that we owe our strength, but to the appreciation that the "world needs less to be taught than reminded." The ambitious is reminded by the prize before his eyes—the dullard by constant nagging. The Americans also believe that enthusiasm without knowledge is better than knowledge without enthusiasm.

In an article in a popular American monthly published in the spring of 1900, Mr. Carnegie expressed unqualified disapproval of trusts as then existing in the United States. In his appreciation that competition is the life of trade and also of labor, he is apparently taking the sound view, in discouraging both labor unons and trusts. Which is the outcome of the other each must decide for himself. It is unquestionably a hindrance to obtaining the full possibilities of a given equipment to allow unions to have a footing. In some places a bricklayer is only allowed to lay a certain number in a day. Unions unquestionably act as a drag on the efficient workman, preventing him from rising above the drone.

It is illogical to restrict unions and not restrict trusts. From the standpoint of the operative manager the unions are a serious menace. It is by the systems in vogue in Pittsburg where relatives, favors, friendship and long service avail not, but only the actual potentialities of the man himself, that such troubles may be partly avoided. Draw no sharp line with a signboard standing by with the inscription, "This is reserved for friends of large stockholders," and unions would be more infrequent.

Unlimited competition may mean slaughter of life, character and resource; but those progress who survive. Too much individualism means too narrow an outlook; too much concentration means self sufficiency, brutality or laziness. There are extremes of each, depending on the age, laws, means of communication and intelligence of the people.

A NEW GRINDING MACHINE WITH AUTOMATIC FEEDS.

A recent product of the Landis Tool Co., of Waynesboro, Pa., shown in the accompanying illustrations, is classed as a semi-universal, self contained type. By this is meant that it does not contain all of the adjustments of the universal machines and that it is run without overhead works. As shown it is arranged with a swiveling head stock which has an adjustable spindle bearing and is provided for the use of a face plate and chuck with which work can be ground at all angles from zero to 90 degrees. Provisions are made in the machine to apply an internal grinding attachment when this is wanted so that straight and taper holes can be ground.

The head stock spindle runs in adjustable bearings and can be locked and work revolved on a dead center by a loose face plate in a similar manner to the smaller machines. The swiveled head is doweled for a straight line position with two tapered pins and is secured to its base by three heavy bolts engaging a circular tee slot. The interior of the head stock is fitted with bevel gearing which operates concentric with the pivot of the swivel by which the power is transmitted to the work driving arrangement thereon at all angles. A shaft extending from the end of the swiveled table of the machine to some distance toward its pivot passes through the base of the stock. This shaft is keywayed and on it a gear is mounted having a spline engaging a keyway, permitting the head to be moved to different positions as required. A lever on the front is arranged to engage and disengage the gearing from this shaft by a clutch for the purpose of stopping the work independent of the traverse, a convenience which is often desired.

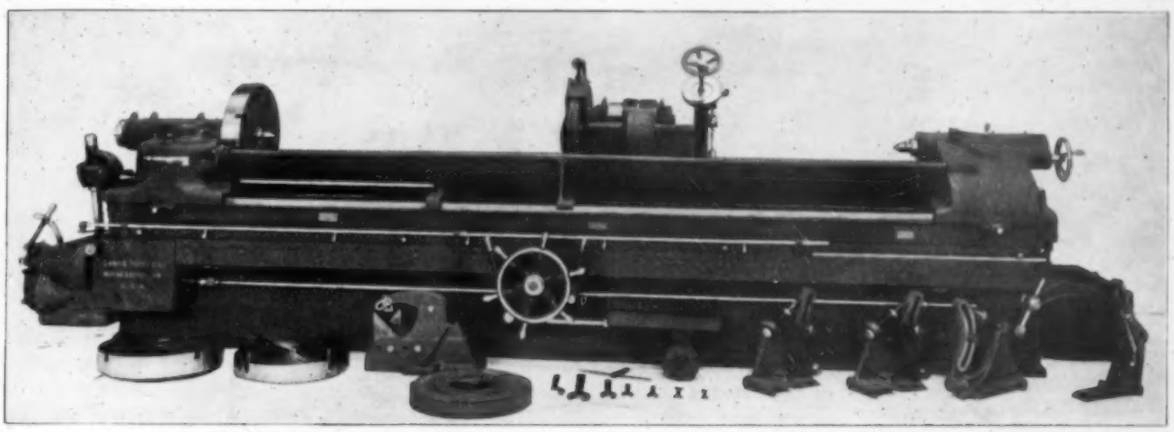


FIG. 1.—FRONT VIEW OF NEW GRINDING MACHINE OF THE LANDIS TOOL CO.

The foot stock spindle has an adjustable bearing and is arranged to be clamped. It is operated by a screw which is back geared to a hand wheel. Both head and foot stock are heavy and are arranged to be positioned on the table by a rack secured to the latter and a pinion on each stock which is operated by a detachable crank rendering the adjustment easy of manipulation.

The emery wheel base is fitted with a heavy spindle with journals 4⅞x15 inches and 4x10 inches and carries an emery wheel 30 inches in diameter by 1½ and 2 inches wide. The emery wheel pulley is 14 inches diameter with 4½ inch belt. The bearings are adjustable and of large size. The emery wheel base is adjustably mounted on a slider which works on a lower slide with large bearing surfaces.

Power for driving the emery wheel is transmitted through a grooved shaft running the whole length of the machine on the rear side. A pully trunnioned in a bracket

secured to the emery wheel carriage passes back and forth over the shaft and is driven by the grooves in the shaft through wheels which makes a practically frictionless travel. A vertical yoke carrying an upper intermediate shaft and pulleys serves as a joint to another yoke connecting with the emery wheel base. This makes a complete connection between the lower shaft and the emery wheel spindle and compensates for the movement of the emery wheel to and from the work, keeping the belts under driving tension. Both yokes are provided with screws to lengthen them in order to tighten the belt as required. This driving mechanism causes no pull upon the carriage guide nor against the wheel feed-up device by the power transmitted to it; the force from the belt pull being all taken up in the yokes themselves. This leaves the carriage free to move and to carry nothing but its weight and the grinding cut.

Motion is transmitted from the rear shaft on the machine at the head stock end, to the gearing for rotating the work and traversing the emery wheel carriage. This arrangement consists of a cone pulley which is loose on the rear shaft and only secured when required to drive the work and feed by a friction clutch. The clutch being operative by a rod on the front of the machine, is convenient to stop and start from any position of the operator in front. The cone pulley connects to the gearing referred to by a belt and is utilized for changing the speed of the work. The feeds in this instance remain constant with relation to the rotation of the work except at such times when a greater variation than these cones will make is desired and then a change is made in the head stock itself by a lever.

The change of traverse feed is made by a lever shown on the gear box at the left hand or head stock end of the machine by which cone gearing, arranged for proper speeds, is positively clutched to the shaft, giving five changes of feed from 3-16 inches to 2 inches at each rotation of the work. There are four changes of work speed acquired by the cone pulleys previously referred to and, in addition, a back gear makes four more which, together with the change made in the head stock, gives in all sixteen changes of work speed, covering a range for every requirement and being from 8 to 200 revolutions.

A hand wheel carriage traverses on the front of the bed with the emery wheel and on it is located a lever for starting and stopping the traverse feed and another for reversing the motion of the carriage by hand. Also a hand wheel by which the carriage can be moved by hand a limited amount. This hand wheel has a clutch so that it can be disengaged while power feeding to avoid its turning. To this carriage is attached a platform which is mounted on wheels and is carried back and forth on which the operator can stand to look over his work which, owing to the size of the machine and the work that can be executed on it, is necessary.

The table, on which are located the head and foot stocks, is pivoted at its center enabling tapers up to 2 inches per foot to be ground. A graduation on the end of the table gives the readings by which it can be set. It is firmly clamped at four points in its length. In swiveling this table universal couplings on the vertical shaft at left hand end of machine compensate for the angular movement.

All gearing is thoroughly protected from dirt as well as from danger to the operator. The screws are covered in an efficient manner and protection at all bearings is fully provided. All parts are massive to meet the best service on the class of work for which it is intended and enable the machine to do its work in a rapid, accurate and economical manner.

This machine is also built when so wanted without a swiveled head stock and simply a plain fixed head substituted, which would make the machine what the company would term a plain grinder and which then would only serve for grinding shafts on their centers both straight and taper. For the finishing of many pieces this is all that is required.

Power can be applied to this machine either direct from the shaft by belt or by electric motor coupled with a driving chain as shown in the illustration.

The capacity of the machine for the performance of heavy work is well illustrated by a series of prints sent out by the Landis Tool Co., showing the character of the product. An engine valve evidently of the rotary or Corliss type and having an overall length on the ground surface of 3 feet 3 ½ inches and 6 inches diameter had .020 of an inch removed in 6 hours. A chilled roll had 1-32 inch removed from the central portion, 22x44 inches, in two hours; a Corliss valve 4 feet 2 inches by 6 inches had .045 inch removed in from 20 to 25 minutes and .020 inch removed in 10 minutes. A similar valve 5 feet 8 inches by 9 inches had .020 inch taken off in 15 minutes. A crank shaft having a central part 16 inches and the two ends reduced to 14 inches, the ends having a length of 13 ⅝ inches respectively and the central portion being 7 feet long was reduced by grinding .025 to .030 of an inch in from 3 ½ to 4 hours.

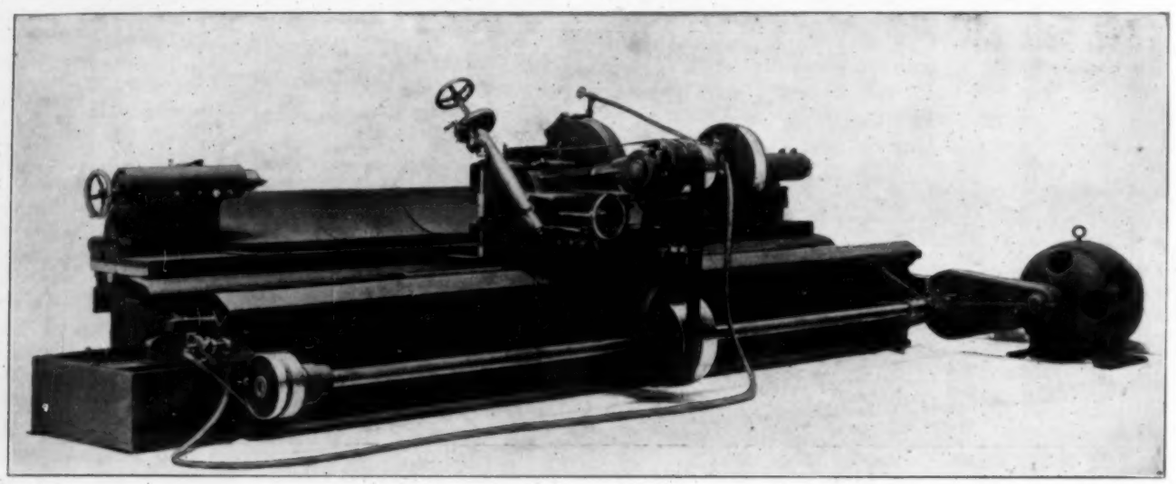


FIG. 2.—REAR VIEW OF NEW MOTOR-DRIVEN GRINDING MACHINE.

This machine is to be known as the No. 25 grinding machine with swivel head stock. The principal specifications are as follows: The capacity is 26 inches swing and 12 ½ feet between centers. The emery wheel is 30 inches diameter and 2 inches thick; emery wheel spindle bearings, 4 ⅞x15 inches and 4x10 inches. Emery wheel pulley, 14 inches diameter for a 4 ½ inch belt. The head stock spindle is 4⅞x12 inches and 4⅞x8 inches and the foot stock spindle is 4 7-16 inches diameter and 24 inches long. The work-carrying centers are 2¾ inches diameter and the machine will grind 2 inches taper per foot. The speed of work has 16 changes from 8 to 200. The speed of traverse of wheel has five changes to each speed of work varying from 3-16 inch to 2 inches per revolution.

A NEW 62-INCH RADIAL DRILL WITH PLAIN TABLE.

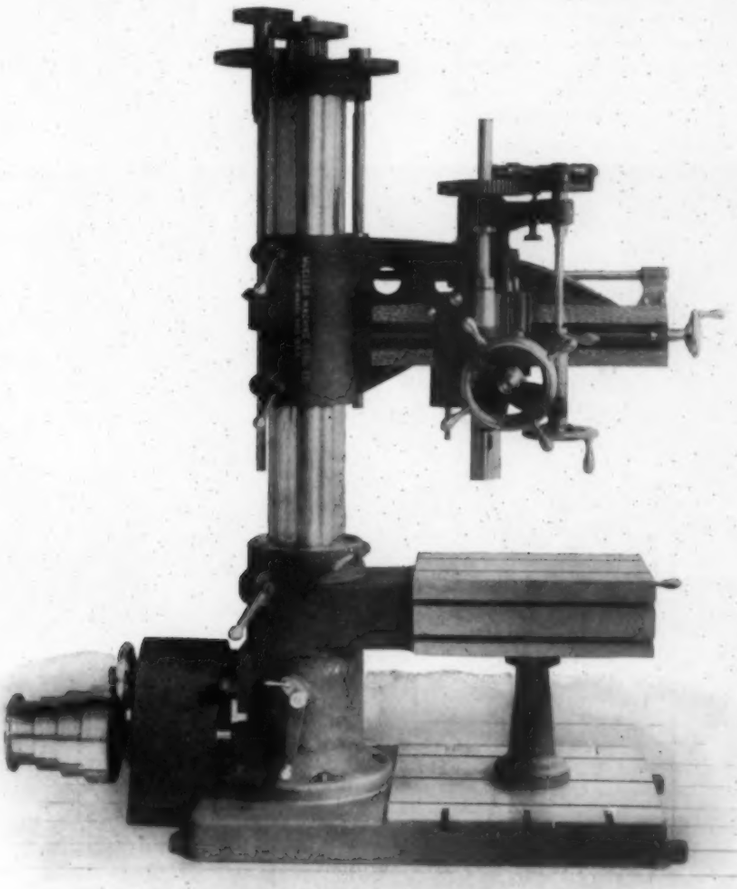
This is a new type machine just placed upon the market by the Mueller Machine Tool Co., of Cincinnati, and has several features of practical interest. The column is of heavy construction and has four internal ribs extending to the top. It does not rotate, but is screwed to a heavy base which has fan-shaped ribbing to ensure stiffness at any point of the machine. The arm is arranged to swivel around this fixed column, is elevated by power and lowered at an increased speed. It is supported by a top cap resting on steel balls and rotates with exceeding ease. A graduated ring is on the lower part of the column, turning with the arm, allowing the spindle to be swung out of the way while placing new work in their fixed jigs, after which the arm can be brought back to the former position.

The saddle is traversed by means of a double pitched screw. A dial on the outer end enables the operator to bring the spindle exactly to the previous position. The spindle is made of crucible steel and carefully ground as are the other bearings of the machine. The spindle is balanced and has a quick return.

The automatic feed is driven through a friction disc on the spindle pinion shaft. Any desired feed from zero to .023 per revolution of the spindle can be instantly obtained by bringing the driven wheel from the center to the outer edge of the disc, this change can also be made while the drill is at work. This automatic feed is arranged by means of adjustable collars to trip at any position of the stroke of the spindle, also at various depths. The tripping dogs are on a graduated bar and do not interfere with the spindle movement. A safety stop throws out the feed when the spindle has reached the limit of the stroke. Sixteen changes of spindle speed are instantly obtainable without stopping the countershaft.

A lever projecting from the loose ring on the column above the table operates either of two self-adjusting and noiseless friction clutches that are under the gear cover to the lower left of the column. This lever starts, stops and reverses the spindle at a high speed when tapping, and is also used to elevate the arm by bringing the lower crank on the column to the left. It may readily occur to the reader who carefully scans the illustration that there may be certain positions of the lever in connection with the work on the table in which the operation of the handle may be more or less inconvenient. The loose ring is coupled with the clutch mechanism by means of an index ring and plug and in such cases as the one indicated the lever can easily be adjusted to any desired position that the operator may prefer.

The table is shown plain but can be furnished round if required. It has a large round hub suitable for a bushing below the center, for using boring bars, etc., which pass through the hollow support on the base. The binder levers have taper holes and can be set to lock at any angle. The leading dimensions of the machine are as follows: Drills to the center of a 62-inch circle; horizontal range of head, 24 inches; vertical range of arm, 28 inches; least distance between drill and column centers, 11½ inches; spindle has Morse taper No. 4; traverse of spindle, 12 inches; width of belt for cone, 2¾ inches; weight of machine, 3200 pounds.



62-INCH RADIAL DRILL WITH PLAIN TABLE.

The preliminary survey and other work has been done at the site of the Schuler steel mill, at Attalia, Ala. The foundation for the blast furnace will soon be laid. Electric light has been provided and work will go on night and day.

The National-Acme Manufacturing Co. and its Automatic Screw Machines.

The standard form of automatic screw machine is essentially a turret lathe, with means for operating the turret and feeding the stock, each tool doing its work and practically but one tool operating at a time. The number of tools which can be employed upon a single piece is in such a case the limiting factor in production and this condition was the starting point from which the designers of the "Acme Automatic" have developed their remarkable machine.

E. C. Henn, the inventor, was formerly connected with the Pratt & Whitney Co., of Hartford, Conn., during the time that the ingenious William Tucker brought out his highly interesting improvements in screw machine practice. Some of these devices designed by Mr. Tucker were described in the series of articles in *The Iron Trade Review* last year, dealing with the notable exhibits of the Pan-American exposition. The earlier form of automatic screw machine developed by Mr. Henn was substantially identical with that at present constructed and the few changes have been matters of detail without any general interference with the older design, which received the John Scott medal. The company as organized in 1893 at Hartford with a force of half a dozen workmen and under the title of the Acme Machine Screw Co., started in to build a machine that would cut off idle time with the same freedom that it would consume stock. Instead of a turret rotating to bring the several tools successively to a single bar, four rods or bars of stock are acted upon simultaneously by all the tools, a principle which makes it entirely feasible to finish a piece with but one set of tools in use in a period which will not exceed the total time required for the longest operation.

The company thus organized in 1893 and incorporated in 1894 was transferred to Cleveland in the present year and under the name of the National-Acme Manufacturing Co., now occupies a four-story fire-proof building of 300x50 feet. Mr. A. W. Henn joined the company in Hartford shortly after its incorporation and the two brothers are still associated in the present management. The company is closely connected with the National Screw & Tack Co., located in the adjoining plant and is supplied with electric power from the same source.

The several departments are equipped with individual motors, the rooms are lofty and well lighted and the working facilities are of the most modern type. The system of keeping track of production was described in *The Iron Trade Review* of Aug. 7. This method was introduced by O. S. Werntz, an official of the company, and there are other original features of value which will receive attention later.

The plant is practically divided off into the machine building and screw-making department. The east end of the factory has the successive floors devoted to lathe, milling machine, planer and other adjuncts to machine manufacture, while the west end contains the raw and finished screw stock on the first floor, and above this the succession of screw producing machinery. One of these batteries of automatic screw machines is illustrated in Fig. 1 and the action of the "Acme Automatic" may be described as follows:

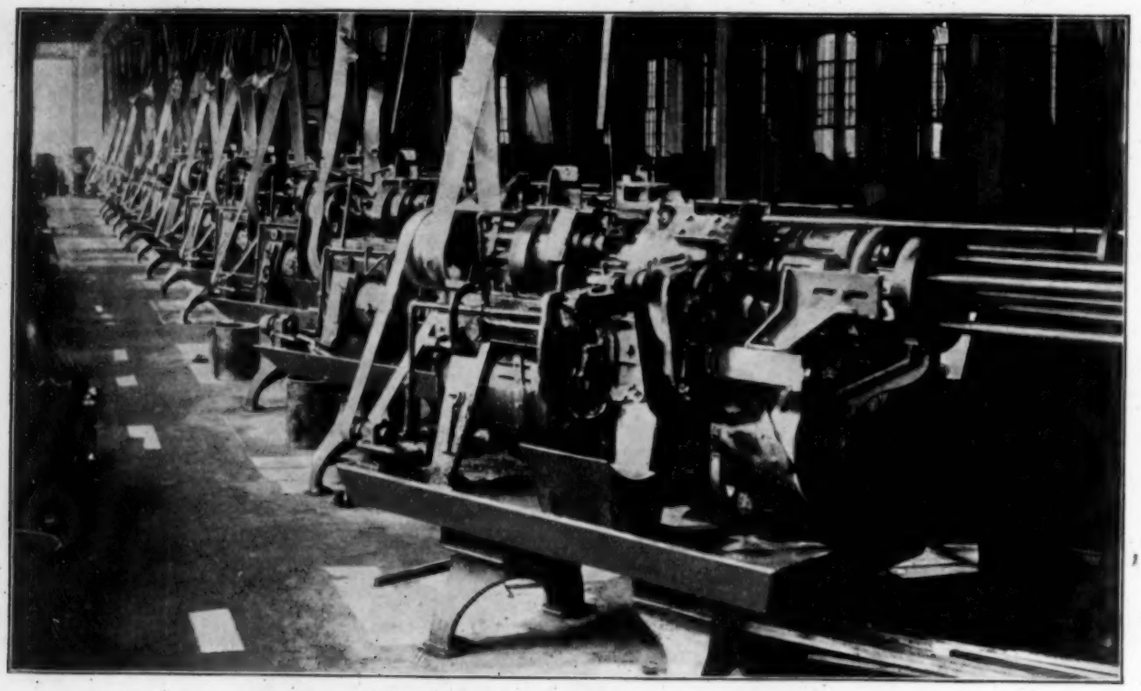


FIG. 1.—A BATTERY OF AUTOMATIC SCREW MACHINES.

Screw Manufacturing Operations.

The four bars of stock, which are carried in a revolving cylinder, have an intermittant orbital motion, and are in direct line with all the end acting tools while the cylinder is locked in place. At the completion of a quarter rotation of the cylinder, the tools, which do not change their line position, are all in readiness to perform again, on the now succeeding bars, the same operations as just completed on the preceding ones. Tracing the action through: when a given bar (a) is having the second operation performed upon it, the bar behind it (b) is having the first operation performed, and when the first bar (a) reaches the third position, the bar behind it (b) is in the second position, and a second bar behind it (c) is in the first position. When the first bar (a) reaches the fourth position it has three bars behind it (b, c, d) upon which the third, second and first operations are being performed. Two ope-

rations are very often done in one position, such as shouldering, forming, knurling, shaving, etc., done by side and top-acting tools at the same time that milling, drilling, reaming, counterboring and threading are done by end-acting tools. Thus from the time the first bar (a) reaches

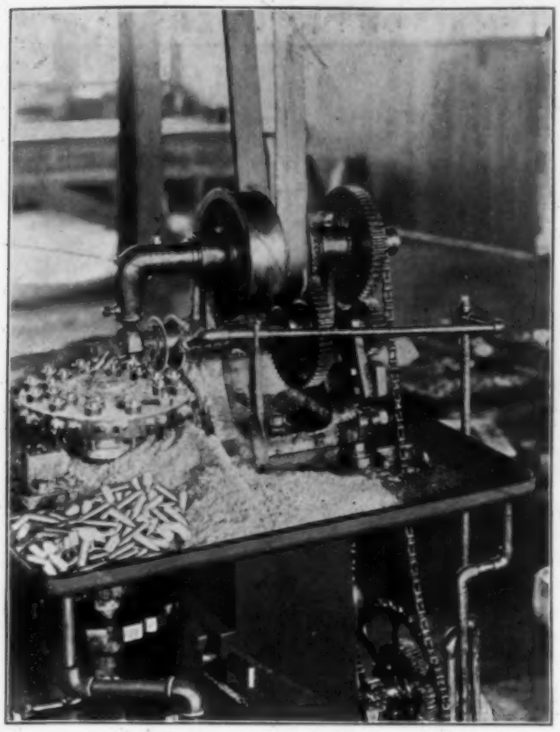


FIG. 2.—A SCREW HEAD SLOTTING MACHINE.

the fourth position until the entire four bars (a, b, c, d) are consumed, each stock spindle holds a piece in some stage of completion, and each quarter turn of the cylinder has a piece completed and cut off.

Four Operations in the Time of One.

Take for example any milled piece. Approximately half the stock is removed by the first end tool; the second tool is adjusted to finish the cut, when the rod has reached the second position, by starting where the first left off. On the same principle three divisions are sometimes made for the drilling of a single hole—methods which if adopted on any single spindle machine would lose instead of gaining time. Threading as the next operation is done slowly, insuring a first class thread, following which the cutting-off tool removes the screw from the bar without crowding the operation, and the result is a product of finished appearance. Considering the removal of the surplus stock as described as two operations, threading and cutting off as two more, not less than four separate and distinct operations are done in the time of one. It is likewise manifest that with the exception of the longest, there is no hurrying of any one operation to increase the output.

Details of the Spindle.

During the threading operation the work spindle does not revolve. Thus it is possible to maintain proper speeds on all tools and is not necessary to run other tools at speeds required by the sluggish tap or die. The threading operation is unique in that no cross belts are used on the machine and there is no reverse motion of any rotating part. The spindle for threading or tapping is fitted with back gears to be used or not as required. The threading spindle is hollow, and when in operation, oil is constantly pumped into it and forced out through the die so that the chips are washed away as fast as made, and the longest screw which can be turned out is abundantly supplied with oil. In threading, the stock spindle is at first stationary, while the tool spindle revolves as slowly or as rapidly as desired; but at the completion of the operation, instead of reversing, the tool spindle runs on and the work spindle starts into rapid motion and runs the work "off" the tool, the "running-on" being done with the tool spindle, the "running off" with the stock spindle.

Another special feature of the threading tool spindle is a finger at its rear, operated by cams, which gives a positive push to the tap or die at the instant either touches the stock. In this way a clean start is guaranteed. The stock spindles are carried in a head occupying the position of a lathe head stock, and the cylinder carrying them rotates within this head, the center of motion being the center of the driving shaft. Each time the cam shaft turns it carries the cylinder through a quarter of a rotation, or in other words, advances each bar of stock to the next tool.

The speed of this quarter turn is increased or decreased according as the normal speed of the tools is faster or slower than the speed at which the cylinder should be revolved. This reduces to a minimum the time intervening between the finished cut and the commencement of the operations on each following bar. This time is further reduced on the No. 1 machine where the stock is fed out while the cylinder is turning, so that the tools act practically with the locking of the cylinder.

Increased automatic action in any machine usually means an increased amount of "setting up" time, but as the tools are all fed to the work simultaneously it follows of necessity that a single cam trip on the feed drum which is selected with reference to the length of the end cut, must suffice for the making of any given piece. The end acting tools are adjusted to requirements in the same manner as in any turret machine.

Worthy of especial mention is the patented shaving tool. This tool is brought into play after the general form has been given to a piece. In addition to holding any shape or form to an absolute size in front and back of a shoulder, it imparts to the product a neat and finished appearance.

The shaving tool occupies a position on the top of the stock and tool retaining cylinders and is operated by means of cams. The cutter acts in opposition to a rest which supports the work and brings the piece closely to size. The writer examined a number of pieces from the machine that were turned out in this snap-gauge fashion and under inspection with a ratchet micrometer the diameters did not vary over a quarter thousandth of an inch on a shank .250-inch in diameter of sample. This result

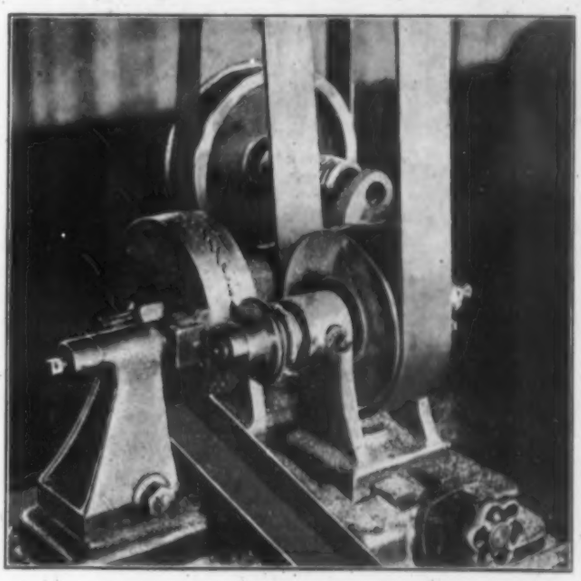


FIG. 3.—A LATER FORM OF SCREW HEAD SLOTTING MACHINE.

gives some idea of the accuracy with which repetition work may be accomplished under modern manufacturing conditions.

The Slotting Process.

The peculiar method of making screws is accompanied

FIG. 4.—LOT OF MACHINES UNDER CONSTRUCTION ON THE ERECTING FLOOR.

by an equally unusual scheme for slotting them. Probably the first expedient for slotting screws and studs was in the time honored machine vise followed by a cam lever or a like contrivance for the more speedy introduction and release of the pieces before and after the cutting operation. Figs. 2 and 3 show the development of the slotting story in the shop under consideration. The former is from a photograph of an old time machine that is still doing good work at a rapid gait in spite of the rough and very ready arrangement. Here are two slitting saws mounted on an arbor—milling machine fashion—and under these is a rotating table having a double series of pockets into which screws may be inserted and either held at the proper height by the head or by means of suitable stops in the table. A train of gears and a chain seen on the right of the machine drive a horizontal shaft extending through the column and on the end of this shaft is fixed a cam which lifts and lowers the table with an alternate "dwell." During this latter period a ratchet acts upon the coarse toothed gear on the upright shaft and at this time the work resting in the pockets of the table is moved one space and the two succeeding pieces to be slotted are brought under the cutters and the cam proceeds to push them against the teeth of the rotating milling cutters and they in turn are slotted. It will be noticed that the operation is continuously automatic exclusive of the dropping of the work into the holes, an extractor removing the slotted pieces.

A Later Screw Head Slotter.

Fig. 3. illustrates an entirely different treatment of the problem. The operator sits at the rear of this machine

FIG. 5.—MILLING MACHINE DEPARTMENT.

and the cutter is mounted on a spindle which turns in a head which can be adjusted to and from the work by means of the handwheel shown. The belt in the rear of the illustration drives a worm and wheel at a relatively slow motion to that of the slitting cutter. The peculiar feature of the machine is in the arrangement for holding

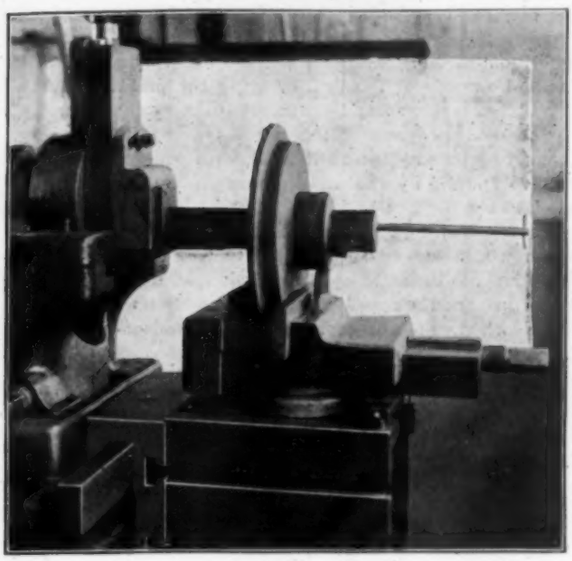


FIG. 6.—A KEY-SEATING EXPEDIENT.

the screws while they are being cut. There are two discs, one of which is rigidly attached to the worm driven shaft, and the other is positively driven by the same shaft, but is permitted a certain looseness of fit on the shaft for a purpose to be described later. These discs have holes drilled around their circumference so that half of each hole appears in the inner faces of the discs and when the two are brought together the cavities will grip the work (screw or stud shanks) for which they are intended. By means of washers the two discs are placed at a proper distance apart and retained there by the aid of the adjusting screw seen on the left of the illustration and in line with the axis of the rear shaft. In front of this is a bracket having an adjustable extension which presses against the rim of the loose disc and of course the latter is thus rocked on its center and the one side of the pair of discs is brought nearer than the other. The operator pushes the work piecemeal into the crevice between the discs and turning toward the slitting cutter they firmly grip the shanks and pass them to the underside where they are released and drop into the inclined trough and thence to a box in front of the machine. A strip of sheet metal extends from the lower and rear side of the machine into the opening to make assurance doubly sure of the positive clearance of the slot from the finished screws so that the operator can confine his work exclusively to the charging of the discs.

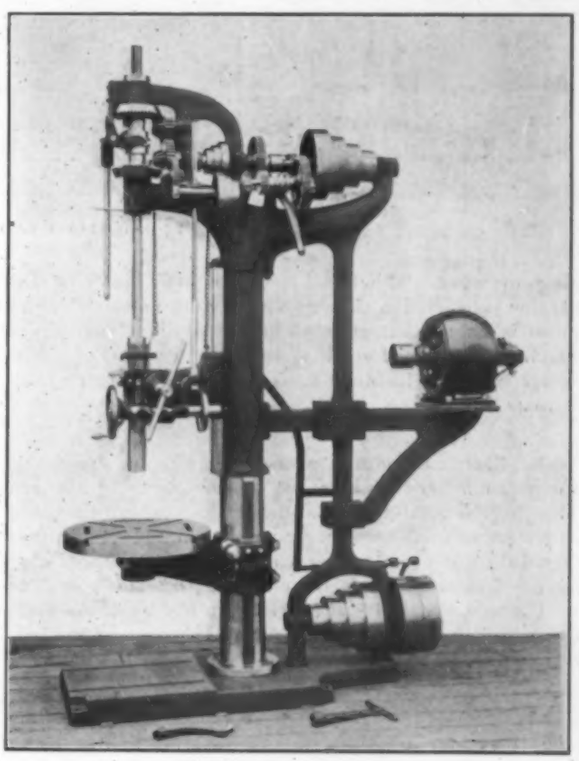
There is a characteristic group of machines shown in course of erection in Fig. 4 and in Fig. 5 is a sightly lot of milling machines, the neatness of the arrangement being followed in other branches of the machine manufacturing departments. A shaper which had ceased to hold its own in the race for the survival of the fittest is seen in Fig. 6 as converted into a keyseating device. The apron is doweled in position and fitted with a short length of shaft which in turn is supplied with a cutter. The latter has a spring which forces it toward the interior of the shaft and a light rod screwed into the end of the shaft is applied to move it in the opposite direction when feeding into the work held in the machine vise.

The Greensburg Foundry & Machine Co. will move its plant from Greensburg, Pa., to Jeannette, Pa. A site of 13 acres has been purchased near the latter place and excavating for the new buildings has been begun.

CINCINNATI MOTOR-DRIVEN UPRIGHT DRILL.

The illustration below is of the "Cincinnati" upright drill, manufactured by the Cincinnati (O.) Machine Tool Co. It has patent geared tapping attachment and is fitted with motor, belt-driven. A suitable bracket is provided which is attached to the frame of the drill and on this the motor is mounted so as to belt to the tight and loose pulleys. This bracket is detachable without impairing the general usefulness of the machine should it be desirable to belt from a line shaft, the motor bracket being simply clamped to the frame of the machine. The application of the motor in this manner brings the armature and brushes at a convenient height for examination and has the additional advantage that the device is the more readily kept free from dirt and chips. The company presents a choice of attachment, however, by fitting the motor on request with direct connection of the cone pulley shaft and the armature by means of spur gearing. In that case the drilling machine base is extended to receive a pedestal on which the motor is mounted and suitable gearing is provided to run the drills at the proper speed. This arrangement can be applied to each size of machine and the motor sets up quite a distance from the floor and out of the way of chips, etc.

There are other features of interest in connection with this line of drill other than the motor attachments. The patented tapping device with quick return motion allows the operator to have the privilege of stopping, starting or reversing the spindle instantly, and he is thereby in a position to do more drilling, as the time consumed in making the changes of drills, chucks and sockets is greatly reduced. With the attachment he can tap right or left hand threads equally well and a forward movement of the lever, shown at the left, starts the spindle and when the tap has gone the required depth a movement of the lever in the opposite direction reverses the spindle and returns the tap twice as fast as it went forward in doing the work, the ratio of the attachment being two to one.



HEAVY TYPE OF MOTOR-DRIVEN UPRIGHT DRILL.

When no tapping is to be done for several hours or days, as the case may be, the attachment can be disengaged by the movement of a lever for this purpose, thus saving the parts from wear and leaving the machine a standard drilling

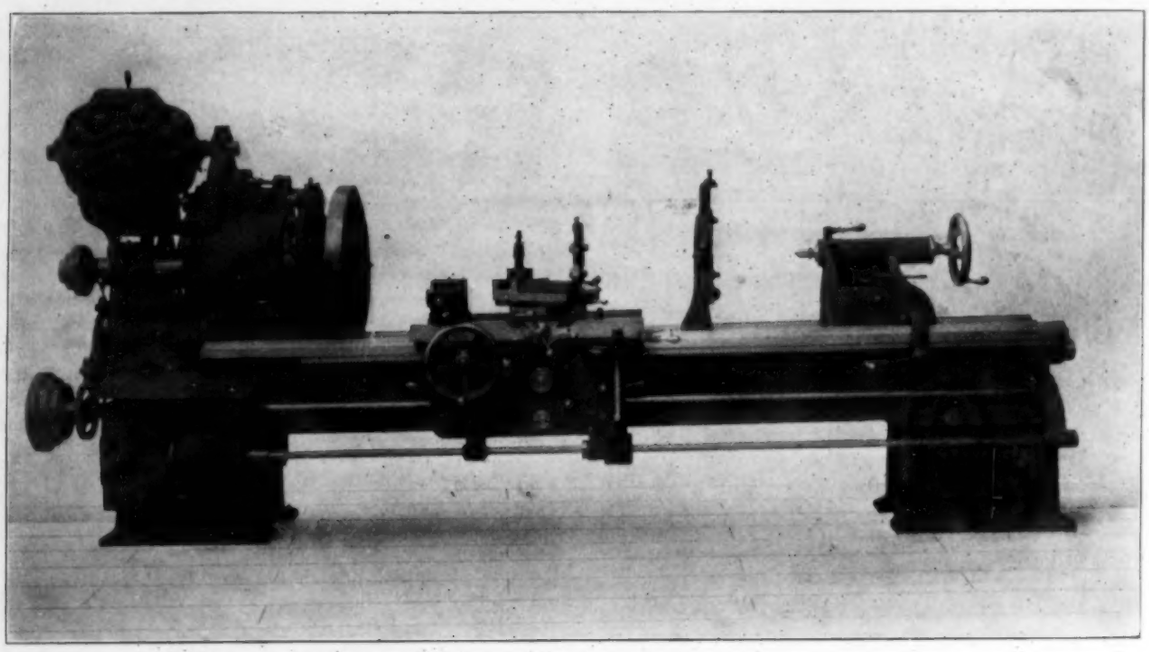
machine with the great advantage of being able to stop, the spindle instantly for making changes of chucks, sockets and drills without requiring the stopping of the machine by the aid of the belt shifter which would consume much greater time. Over and above the matter of time is the ease of operation. The writer found on handling one of these drills that use of the tapping attachment left the spindle perfectly free for the removal of the one drill and the insertion of another and there was little or no effort necessary in turning the spindel for the insertion of the wedge key in driving out the drill.

The drills, which are made unusually heavy and rigid, with ball thrust bearings, with strong gearing and large driving pulleys, are capable of doing very vigorous tapping, and as an example the writer was told that a 24-inch machine with one of these tapping attachments handles 1½-inch pipe taps or 2-inch standard taps quite successfully. Cast iron parts can be tapped with 1-inch, or smaller taps, without the use of the back gears, and since the taps may be started quickly and true, great reductions are made in the cost of tapping over the old methods of doing this class of work. The attachment contains improved expansion ring friction clutches which work noiselessly, and there is an absence of sticking or strain, allowing the spindle to be rotated in either direction by means of a conveniently placed hand lever. These drills are made from 21 to 42 inches.

ENGINE LATHE WITH ELECTRIC DRIVE.

The accompanying engraving shows a 24-inch engine lathe, with an improved method of electric drive, just brought through by the American Tool Works Co., of Cincinnati, builders of lathes, planers, shapers, and upright and radial drills. The lathe itself is the regular standard machine, and embodies the well known features of the "American" lathes. The drop V-bed gives two inches additional swing without raising the head. The lead screw is on the inside of the bed, bringing the pull directly under the cutting tool and centralizing the strain. The motor is of the double commutator type, 3 h. p., and is mounted on a saddle on the head, with communication direct to spindle by raw hide pinion and intermediate slip gear.

The controlling apparatus for starting, stopping and reversing, is arranged at the right end of carriage. There are four fundamental speeds obtainable from the motor itself through the speed controller directly under the head. This with the spindle gearing, gives a total of sixteen distinct and positive spindle speeds available. It is claimed that the efficiency of the motor is practically constant at all speeds. It reverses at the same speed as when going forward.



24-INCH ENGINE LATHE WITH MOTOR DRIVE.

The Christmas annual of *Country Life in America* is a double number with three supplements in color and tint. The cover is a strikingly beautiful piece of work and the ample pages of the number carry a hundred illustrations that in subject and in execution are of extraordinary merit. Winter scenes in the country, particularly such as are connected with winter sports are a feature of the number, which in its entirety is a superb specimen of the best in illustrated journalism.

It is understood that the Grand Trunk Railway has decided to center in Stratford, the chief locomotive repair shops for the system in Canada. Master Mechanic Patterson is now inspecting leading railway workshops of the United States for the purpose of seeing the newest equipments. On his return he will draft plans for the enlargement of the shops. The making of extensions will be commenced in the spring. The works at Montreal will be devoted exclusively to building new locomotives.

The directors of the Pennsylvania Railroad, the Pennsylvania Co., and the Panhandle road have just authorized improvements which will cost more than $10,000,000. The Pennsylvania Railroad Co. will expend nearly $3,000,000 on improvements between Philadelphia and Harrisburg. The directors of the Pennsylvania Co. authorized the expenditure of $6,000,000 for improvements on the Northwest system, to be completed within the next two years. These will include the double-tracking of the Fort Wayne between Pittsburg and Chicago, the work to be done in that direction being principally upon the Western division, between Crestline and Chicago; also for double-tracking the Cleveland & Pittsburg between Hudson and Ravenna. The directors also approved the surveys for a contemplated new line to extend from Lawrence Junction, on the Fort Wayne, to Redbank, on the low-grade division of the Allegheny Valley.

The American Tube Co., of Somerville, Mass., has bought 46 acres of land, having nearly a mile of water frontage, on which it will build a new plant, which will cost in the neighborhood of $1,000,000.

Some New Things for the Shop, Chiefly by Way of the Patent Office.

A Flexible Metallic Tube Without Joints.

The inventor of this method of flexible tube construction, Charles Rudolph, of Paris, France, has thrown overboard entirely the idea of making a metal tube with overlapping strips having a packing medium to maintain the joint tight against the working pressure—the pressure being air, steam, hydraulic or the like. In order to conduct a fluid, liquid or gas between two moveable points a flexible tube must be employed. This is constantly being bent in such service; and one of the most obvious and practical means of employing a metal tube for this purpose and at the same time avoiding strain of piping, tube and connections, is to give it a spiral or corkscrew form as suggested by the coiled affair seen in Fig. 1. This device has been patented at least once since it was applied to a steam carriage built in 1825. In the case of the steam carriage the arrangement was utilized for a flexible connection between the generator and the engine. This form confers considerable elasticity upon the tube and the device yields easily to the strains which would otherwise deform the passage way. Starting from this tube idea, the inventor recognizes the fact that the coils being unsustained the spiral may get out of shape or be stretched out to excess. Following this line of thought he proceeds to make a tube as shown in cross-section in Fig. 2, the cross-section being brought to the oval form by gradual passage through a series of dies and it is given the shape shown in Fig. 3 where the cross-section of the tube has been curved as well as flattened, A being the interior of the tube through which the fluid passes and B and C two grooves with the bottoms bent in opposite directions. The tube is then twisted up in spiral shape as in Fig. 4 where the outer edges D and E of the grooves are respectively inserted, one in the groove C with its hollow turned toward the outside of the tube and the other in the groove B with its hollow toward the inside of the tube. The several spirals are thus hooked one into the other and give each other a mutual support against the strains which have a tendency to distort them. These strains may be due to the inside pressure of the fluids passing through the tube or may come from the outside, as by reason of a blow, being drawn out or subjected to compression, as the case may be. The clasping of the coils, however, allows of a sufficient flexibility in the tube to permit of being bent to some exent.

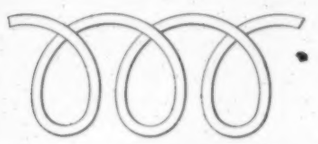


FIG. 1.—THE STARTING POINT.

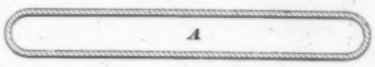


FIG. 2.—THE FLATTENED TUBE.

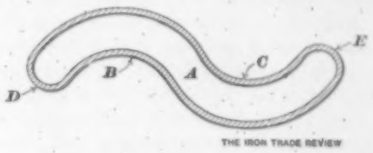


FIG. 3.—THE TUBE READY FOR CASTING.

The inventor submits these forms as examples only and broadly claims the characteristic point of his invention as the preparation of a tube in such a manner that when it is rolled up in spiral form the coils hook into one another so as to afford a mutual support.

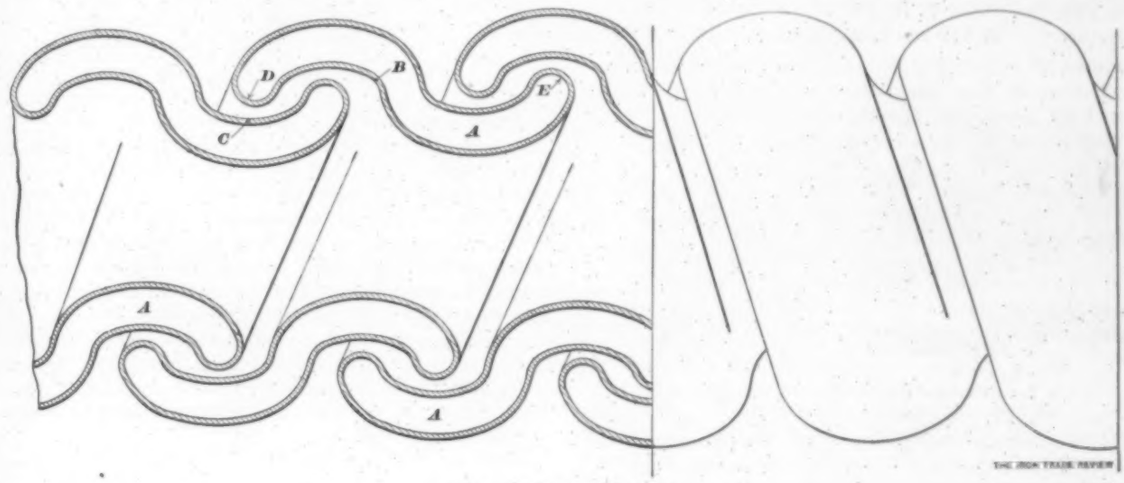


FIG. 4.—THE COILED TUBE.

Work Rest for Grinding Machines.

A patent for a work rest for grinding machines has recently been granted to A. B. Landis, of Waynesboro, Pa. The improvement is directed at the production of such a work rest which may be adjusted to different posi-

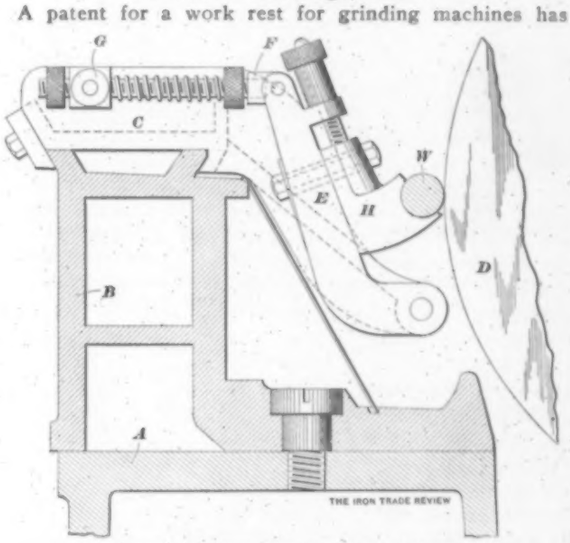


FIG. 6.—WORK REST FOR GRINDING MACHINES.

tions in relation to the grinding wheel to suit work of various sizes and may be held to the work both rigidly and under a yielding tension of an adjustable character. The part marked A in Fig. 6 is the bed of the machine, B the table and C the support of the work rest. The base C is mounted on suitable ways on the bed B and fastened down by a clamping bar and screw bolt adapted to engage under the angle of the corner of the rear side of the table forming the way on which the support C is to be adjusted. The front portion of the support C extends downward at an angle from the top of the table to a point beneath the work W and the abrasive wheel D. The arm E is pivoted at the lower end to the projection from C and has a short arm or socket F pivoted to the upper end. A bolt engages at the front end in this socket and at the rear is mounted in a hole through a lug pivoted on the side of the support C. The piece H rests against the work W. The parts being in the position shown in the engraving and the bearing block H adjusted in the proper relation to the work W, the spring acting through the connecting parts against the upper end of the pivoted arm will hold the bearing block yieldingly to such work, the tension of the spring being regulated by the proper adjustment of the nut. The pivoted nut G permits the ready adjustment and movement of the parts without any binding. By means of the rear nut the forward movement of the bearing block may be limited when desired.

A Drill and Lathe Chuck.

A somewhat simple but probably none the less effective improvement in the construction of chucks has been patented by Oliver M. Mowat, of Allegheny, Pa. The invention relates to that class of chuck in which the drill

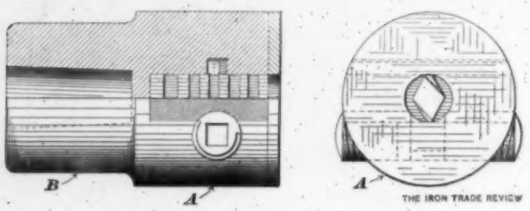


FIG. 7.—SIDE AND END ELEVATION OF CHUCK.

is held by means of adjustable jaws. The designer proposes to positively drive the drills which may be held by the chuck and that the jaws shall be so contrived that they will not only insure positive driving but equally positive alignment.

The chuck is shown in Fig. 7 which presents a side and end elevation. The chuck jaws are illustrated by Fig. 8 and sections of the chuck jaws are seen in Fig. 9.

The body of the chuck is shown at A and the extension

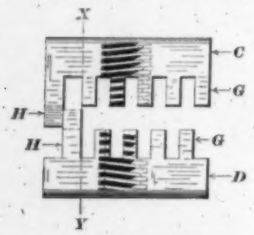


FIG. 8.—THE CHUCK JAWS.

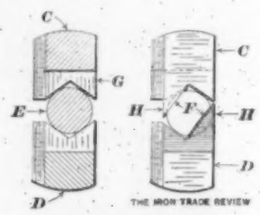


FIG. 9.—SECTIONAL VIEW OF CHUCK JAWS.

B is bored out for attachment to the spindle of the lathe in the usual way. The body A is channeled out to receive the adjustable jaws C and D and these are moved toward or away from each other by means of the familiar right and left handed screw, threaded into the body and engaging threads on the jaws. These jaws, C and D, are adapted to hold the drill or other tool E and besides aligning the tool within the jaws they are adapted to positively drive the tool and this end is attained by providing flat places F on the drill at opposite sides and at the rear end. Each jaw is provided with a series of lining up teeth G and at their inner ends they carry driving teeth H.

It will be understood that each jaw has one of the lining up teeth G on the same transverse plane with its driving teeth H, and the two lining up teeth which are on a plane with the two driving teeth engage the drill on the opposite sides so that it is positively aligned at the same point at which it is driven and also aligned throughout the length of the jaws.

A Pipe Coupling.

A form of pipe coupling is the subject of a patent granted to Clarence L. Wilmot, of Pittsburg. The device is shown in Fig. 10 which represents a transverse section showing a part of the joint. The coupling will probably be mainly employed for connecting the ends of thin or light walled tubing. It consists of a packing ring A arranged to fit neatly around the registering ends of the pipes and against one of the end faces is pressed a ring B having a projection C which is forced into the

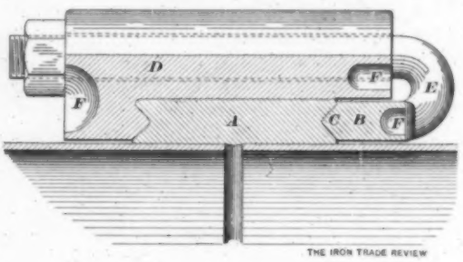


FIG. 10.—A COUPLING FOR THIN PIPE.

gasket to compress and distort it evenly against the pipe.

An outer metal coupling ring D surrounds the gasket and at least a portion of the compressing ring and is provided with an inwardly projecting ring portion with an angular projection similar to C arranged to engage the end of the gasket. The coupling ring is provided with hollow ribs or bosses to receive hook bolts E, the hook portions engaging the outer part of the compressing ring. The coupling ring and the compressing ring may both be cored out or provided with arc-shaped recesses F which serve to lighten these parts and reduce their cost. The bosses or hollow ribs also serve the same purpose and enable the coupling ring to be made of a less thickness than would otherwise be possible.

When the coupling parts are assembled about the ends of the pipe in the manner shown by the illustration, the nuts being screwed up, the projections on the coupling ring and the compressing ring are forced into the gasket A, distorting and compressing it against the end portion of the pipe and sealing the joint.

The inventor shows alternative designs where the bolts are straight and the part B is similar to the part seen on the left of the engraving.

A Cutting-Off Tool.

An elevation and sectional plan view of a cutting-off tool invented by Charles W. Grant, of Derby, Conn., ap-

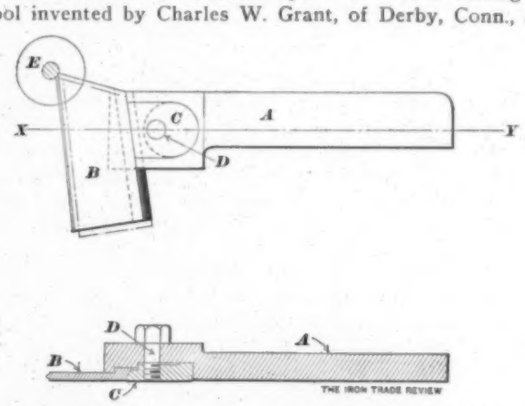


FIG. 11.—ELEVATION AND SECTIONAL PLAN.

pears in Fig. 11. The lower view is a section taken along the line X—Y in the upper portion of the illustration.

The tool is adjustable vertically and the profile of the

cutting face will ensure a flat face to parts cut off and will permit a part to be broken off after cutting down to one-third the diameter without danger of the fracture extending beneath the surface of the part broken off or the main part. This saves time and prevents the loss of parts by reason of the fracture extending beneath the surface. The tool is so contrived that the cutter may be removed without disturbing the holder.

The tool as a whole comprises four parts: a holder A, a cutter B, a clamping piece C and a locking screw D. The front face of the cutter is provided with a three sided angular rib. The central cutting edge is at the apex of this rib, that is, at the top of the cutter—and the lateral cutting edges are on the opposite sides of the rib. The central cutting edge leads and cuts a small groove dividing the chip into three parts and permitting a very fast feed of the cutter.

An English Tool Holder Patent.

This device shown in Fig. 12 has been patented in England by Frederick G. Bowman, of Glasgow and Robert Sommerville, of Edinburgh. The inventors aver that the improvement has for its object the provision of a simple and efficient toolholder for turning lathes, planing machines, etc. The views of the tool shown in Fig. 12 represent an elevation of the device and, in the lower part

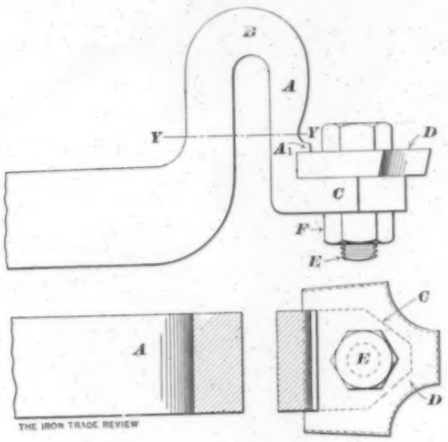


FIG. 12.—AN ENGLISH TOOL HOLDER.

of the illustration, a sectional plan taken along the line Y—Y of the upper view. The tool holder A is made in the form of an ordinary lathe cutting tool from a square bar and has a U-shaped bend B at the free end to give the requisite resiliency but instead of having a cutting edge formed on the end, it there terminates in a flattened portion C to which a removable cutter D of any desired form is secured by a screw threaded bolt E passing through an opening in both the holder and the cutter and held by a nut F. The cutting tool D is made of a flat piece adapted to rest against the face of the tool holder end and may be interchangeable and have a number of cutting edges. At the end of the tool holder is formed a slot or notch into which the rear edge of the cutter is fitted so that it is firmly held and prevented from tilting under the cutting strain.

An Electro-Magnetic Transmission Gear.

There are gears and gears, and the one here described and illustrated is a little out of the beaten track followed by the majority of gearing designers. The inventor Hardman A. Earle, of Manchester, Eng., has endeavored to arrange the two members of the system so that without actual contact the two shafts shall be clutched or unclutched at pleasure of the operator. He performs this apparent paradox by energizing one of the members by a current of electricity to obtain this mutual action and thus cause the one member of the arrangement to follow and accompany the rotation of the other and, on the other hand, to become unclutched on a cessation of the energizing current.

The device is shown in Fig. 13, the view on the left of the illustration being a longtitudinal section whilst the view on the right is a transverse section. One of the members A of the transmission gear is a hollow cylinder of iron or steel having the one end open and its other end closed by a disc formed in one piece with the cylinder and made with a hub which is keyed on one of the shafts B to be clutched. A number of copper rods C are passed through holes bored lengthwise in the cylindrical shell and have their ends riveted over copper rings D. The rings D join up the rods C so as to form closed paths for the electric currents induced in them. It is the mutual action between these currents and those in the rotating electro-magnet that causes power to be transmitted from one member of the gearing to the other.

The other member of the transmission gear is keyed on the shaft E which is in line with the other B, and this member is an electro-magnet of such diameter that it can rotate freely within the cylinder A without touching the internal surface. This electro-magnet consists of a hub having an even number of radial pole projections, every one or alternate one of which is wound with a coil of insulated wire; making a number of poles of one polarity having between every pair of them a pole of opposite polarity, the ends of the wires being connected to two insulated rings F fixed on the hub. This electro-magnet which constitutes one member of the transmission gear is keyed on one of the shafts, E, and is inserted into the hollow cylinder A which constitutes the other member. By means of conducting brushes bearing on the two in-

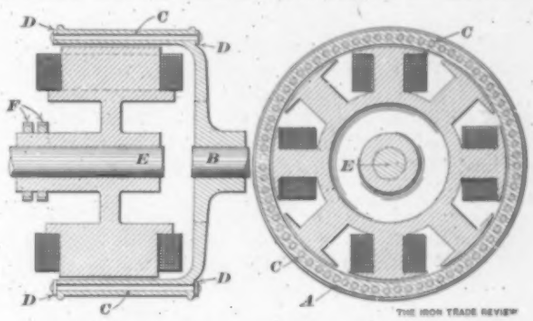


FIG. 13.—AN ELECTRO-MAGNETIC TRANSMISSION GEAR.

sulated rings F a direct and continuous electric current can be transmitted through the coils energizing the magnet poles so that when one of the members of the transmission gear rotates the other is caused to rotate with it.

An Automatic Connecting Rod Key.

The joints of a steam engine have in themselves no greater immunity from disaster than the moving parts of other machinery but in the very nature of things they are much more difficult to adjust whilst in motion as compared with many machines. A stop of the motive power of a large plant or even a small one is so wasteful of productive time that risks are often assumed rather the factory to a halt. There is also the very limited range than bring the factory to a halt. There is also the very limited range of adjustment which intervenes between a "hot box" and a "pound" which renders the care of any large power plant a matter of keen discrimination tempered by a goodly store of practical experience. Facing these demands, the engine designer occasionally indulges in such iridescent dreams as the application of some automatic appliance which would make the necessary adjustments for wear even when the engine was at work. These projects make their way into the patent office at rare intervals but as a rule fail to find favor among engine builders. Perhaps the fact that the wear is not equally distributed around the crankpin has so far stood in the path of any device to take care of that oval-growing and tender source of trouble.

However this has not deterred Elmer J. Brewster, of Chicago, who has patented an improved joint for connecting rods which is shown in Fig. 14. The illustration represents a side elevation of a portion of a connecting

rod comprising the joint with the pivot pin, some parts being broken away to show interior details. The connecting rod is indicated by A and B is the pivot or wrist pin and C C the brasses of the wrist pin bearing. The strap which retains the brasses in position is shown at D. There is a gib E lodged against the inner brass between the two sides of the strap, being of the full width of the latter and having a bearing therefore to that full width against the brasses. The take-up key is shown at F, which is tapered to correspond with the taper of the gib

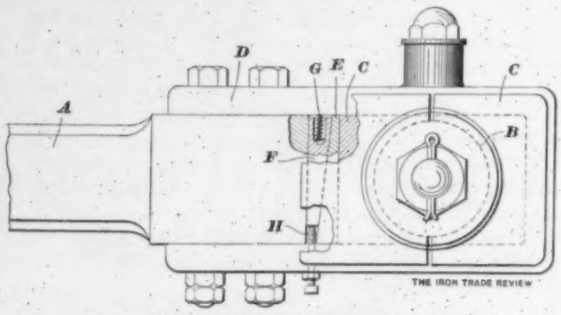


FIG. 14.—AN AUTOMATIC CONNECTING-ROD KEY.

E and also to the width of the gib and the strap but shorter than the width between the two sides of the strap —that is, than the height of the brasses. A spring G is lodged between the wider end of the key F and the strap at that side, the key being provided with a slight socket to seat the end of the spring which thus reacts between the key and the side of the strap, tending to thrust the key inward and cause it to take up any lost motion in the joint. The tension of the spring is intended to be light, being only sufficient to prevent the key from jolting upward but not to drive it down forcibly and make the joint too light.

A check screw H may be provided to prevent the possibility of the key dropping into the limit. This screw H is set through the strap toward the narrow end of the key to limit the thrust of the latter under the impulse of the spring G; being used thus in assembling the parts to hold the key up and keep the bearing open when applying the brasses about the pivot pin and, secondly, to loosen the joint temporarily when the brasses become heating in moving.

A Spacing Center Punch.

A prolific inventor of machinists' small tools has taken the center punch in hand and has recently been allowed a patent. The construction devised by Leroy S. Starrett, of Athol, Mass. is a radical departure from the familiar form of center punch and is depicited in Fig. 15. The device is a combination prick punch and spacing tool for laying off work—marking off the limits of holes for drilling, the marking out of dies for milling, drilling, etc. The punch is solid—made from tool steel and properly tempered. The guide point is set in a socket with a spiral spring to press it down. When the punch is struck, the guide presses back into the socket permitting the punch to be set straight over the work. The screw with chuck nut enables the workman to set the spacer right for small or large drills.

FIG. 15.—SPACING CENTER PUNCH.

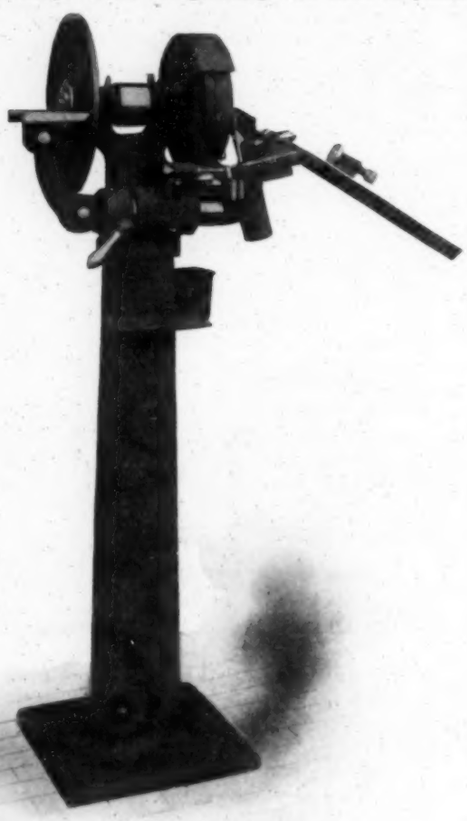
The mechanic will see that the arrangement renders the workman independent of a pair of dividers in many instances, as the center punch here described will space from the adjoining hole, or another center as well as lay out the drilling limit.

Under the terms of the will of the late Herr Krupp the great works at Essen pass to his eldest daughter Bertha, who will be represented by her mother until she reaches her majority. Frau Krupp has given $750,000 to establish a benefit fund for the workmen at Essen in memory of her late husband and $250,000 for the improvement of the city.

DISC GRINDING ATTACHMENT.

A disc grinding attachment for application to the American twist drill grinder has recently been brought out by L. S. Heald & Son, of Barre, Mass. The machine as equipped with the attachment is illustrated herewith and it will be recognized that the device is even more a general shop convenience than ever. The tool is now not only provided with means for handling work that has been hitherto done in a far less satisfactory and much more laborious manner by the aid of the file, followed up with a stick and a piece of emery cloth when a trifle of polish was requisite, but has all the advantages of the drill grinder previously made by this company. The tool will readily sharpen all kinds of twist, flat and straight fluted drills, three and four lip drills, chucking reamers, etc., and the device is so designed that the variation in size of drills does not make any difference in the character of the grinding.

It is one of the unaccountable peculiarities, even in some of the best shops where the grinding of a lathe or planer



AMERICAN DRILL GRINDER WITH DISC GRINDING ATTACHMENT.

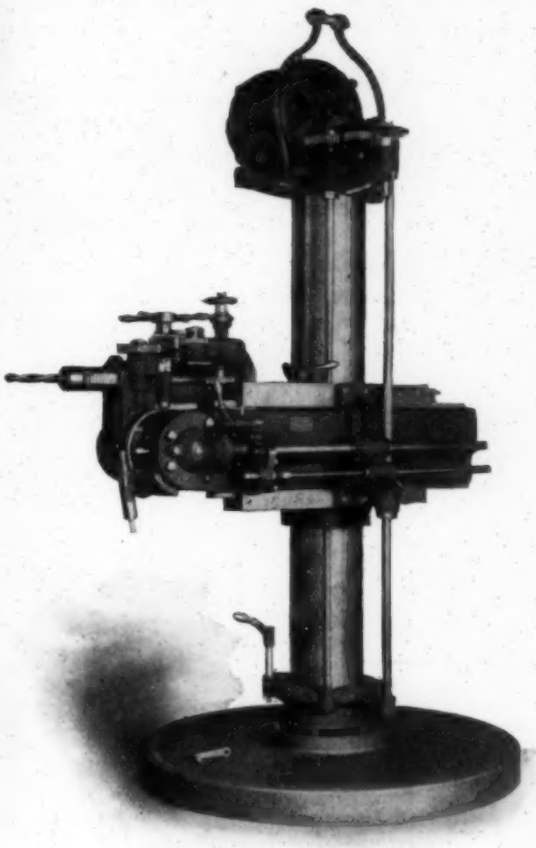
tool by any other than a tool room employe is tantamount to an invitation for dismissal, that twist drills are hand ground and in the majority of instances the work may be undertaken by anyone who cares to do it. Yet in order to have a drill cut right the point must be in the center, the cutting lips of equal strength and the clearance just right for the work in hand. Hand grinding of the average type is no security for this much to be desired result. One lip may do all the cutting, with the result that the drill gets dull quickly, cuts over size, runs hard and gets hot and useless. With the use of disc grinders and the avoidance of file finish, twist drill grinders are recognized as keeping step with modern machine shop progress..

The machine illustrated has the wheel arbor running in double taper bearings with the belt pulley between them and the grinding wheel is made in the form of a ring which is held in a safety clutch which avoids all danger of breakage. With this construction there is no nut or washer to be in the way when the wheel is partly worn out. The

drill is rigidly supported close to the grinding wheel and the improved lip rest makes allowance for the thick web of a large drill as well as the thinner web of a small one. There is also a safety stop which prevents the careless workman getting the drill holder against the grinding wheel.

IMPROVED PORTABLE RADIAL DRILL.

A universal radial drill of peculiar construction has been designed by A. Mill, M. E., of the firm of Roos & Mill, Cincinnati, and installed at the East Norwood plant of the Bullock Electric Co. The machine is intended for drilling and counterboring horizontal and vertical holes in motor and generator yokes from 6 to 15 feet inside diameter. The machine is entirely selfcontained and when put to work is simply lifted by a crane and located exactly in the center of the yoke casting which is to be drilled. The base of the radial drill is then rigidly clamped to the T-slotted floorplate to which the yoke is also secured by means of bolts. The center line of the drill spindle when



THE ROOS & MILL PORTABLE RADIAL DRILL.

in a horizontal position is in line with the axis of the column and all horizontal holes drilled in concentric circles will be in line with the center of each circle.

The outside column or sleeve is supported by the inner stump and rests at the bottom on conical, and is borne elsewhere by cylindrical, antifriction roller bearings. The sleeve can be locked solidly by means of a clamping ring and pin. The saddle which surrounds the sleeve and supports the sliding radial arm can be raised and lowered by power and more delicately adjusted by hand to the exact position required. This saddle has a feather which fits into the spline of the sleeve and is easy to lock in the required vertical positions with clamping bolts. The arm is of box girder shape and can be moved in the saddle by power. The head is mounted at the end of the arm and can be swiveled around a horizontal axis by means of worm gearing, is graduated in degrees and maintained in horizontal and vertical positions by the aid of dowel pins.

The drill spindle has a positive variable feed of four easily handled changes with a quick return arrangement and is backgeared direct on to the spindle driving gear. The back gearing arrangement can be thrown in or out when the machine is at work with safety. The column at the top where the motor is placed, is provided with an eyebolt suspension rig for the hook of the traveling crane.

The machine can be mounted on an individual T-slotted base which can also be provided with a table, the combination then resulting in a universal radial drill capable of drilling and tapping holes in any direction within its range. It is built by Roos & Mill.

Orders for Cars and Locomotives.

Among recent orders for locomotives are: 25 for the Southern R. R. from the Baldwin Locomotive Works; 40 for the Norfolk & Western, 20 from the Baldwin Locomotive Works and 20 from the American Locomotive Co.; 12 for the Chicago Belt, from the American Locomotive Co.; 25 for the Pittsburg & Lake Erie, from the the Pittsburg works of the American Locomotive Co.; 20 for the Missouri, Kansas & Texas, from the Schenectady works of the American Locomotive Co.; four compound six wheel saddle tank for Colorado Fuel & Iron Co., from Baldwin Locomotive Works; 25 for Chesapeake & Ohio, from American Locomotive Co.

Among the orders for cars are the following: Chicago Junction, 20 freights, from Haskell & Barker; Canadian Pacific, 50 coaches, from Barney & Smith; the St. Louis & San Francisco, 50 flat cars, from the American Car & Foundry Co.; Evansville & Terre Haute, 350 freight cars, from the American Car & Foundry Co.; Fort Worth & Denver, 200 freight cars, same company; Denver & Rio Grande, 750 freight cars, same company; Louisiana & Northwest, 50 box cars, same company; National Salt Co., 25 dump cars, same company; the Armour Car Lines, 400 fruit cars, same company; the Johnson Auto-Refrigerating Co., five refrigerating cars, same company; Central R. R. of New Jersey, 50 steel gondolas, same company; New York Central & Hudson River R. R., 10 baggage cars, same company; the Southern Pacific, 100 chair cars, from the Pullman Co.

A Mechanical Vade Mecum.

The *Mechanical World* "pocket diary and year book for 1903," has been issued. This is the 16th year of publication and the book is an astonishing production at the price, even with the preceding period of experience in handbook making. It is a cloth bound book, 4x6 inches, and contains 371 pages, at least one-third of them devoted to a varied collection of engineering notes, rules, tables and data. The remaining pages have space for a calendar, a diary (a daily line of two), and an index, while scattered among these is more or less advertising matter. The amount of advertising material does not heavily burden the book and it is on the other hand a factor in keeping down the expense of the production and generally paying the freight. The price is given at 6 pence (net) and we must admit that there is nothing of the kind in this country to compare with it in appearance at that figure. Of course nothing but a regular use of the data will determine for each one how valuable the material is in any case. In accuracy in a work of this kind is doubly dangerous and altogether too expensive a form of risk; on the other hand, the scrutiny of the preceding years should have purged the record to a liberal extent and rendered it the more worthy of a working confidence. The book is published by Emmott & Co., of New Bridge, Manchester, Eng.

The contract for building three steel bridges over the Long Island railway tracks at Jamaica, L. I., has been awarded to the Owego Bridge Co. The bridges will be 107 feet long and 60 feet wide, allowing for a forty foot roadway with two ten foot sidewalks. The steel work alone will cost about $25,000.

New Brown & Sharpe Universal Milling Machine.

The Brown & Sharpe Mfg. Co., of Providence, R. I., has designed a new universal milling machine, which embodies features of special interest. One of these is the entire absence of the usual feed pulleys and belts, thus eliminating the overhanging brackets and other appurtenances necessary to a belt driven feed.

The variable feeding mechanism is an entirely new feature worthy of detailed description. It is driven from the

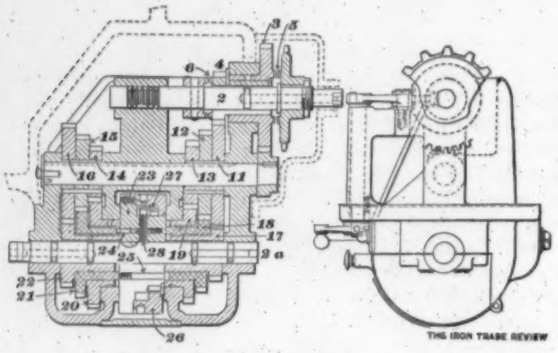


FIG. 1.

main spindle of the machine by a chain and sprocket wheels. The gearing of the mechanism itself being spur gears and the drive to the feed clutch gears in the knee being also by spur gears, all with properly arranged bearings, the loss of power by friction is slight, thus making the efficiency unusually high. It is designed to obtain a wide range of feeds, varying in geometrical progression, fully covering all the requirements of modern milling machine practice. The mechanism, as a whole, is self-contained and care has been taken to insure ease and quickness of manipulation.

The drive is from the main spindle of the machine by chain to the sprocket wheel 1, Fig. 1, that drives the shaft 2. This shaft carries the two main driving gears 3 and 4, the gear running directly upon the shaft and the gear 3 upon the hub of this gear, these in turn being driven by the clutches 5 and 6. The clutches are operated by the lever 7, Fig. 2; which, when thrown over against the stop

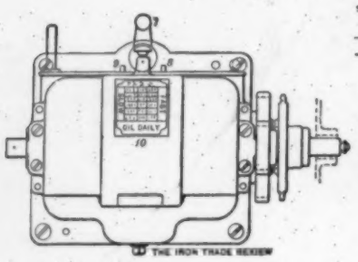


FIG. 2.

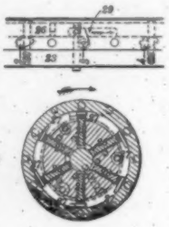


FIG. 3.

pin 8, engages the clutch 5 with the gear 3, making it the driver and giving the fast series of speeds indicated on the table 10. When in the reverse position, or against the stop pin 9, the clutch 5 is thrown out and the clutch 6 engages the gear 4, and the slow series of speeds is obtained. The power is transmitted from either of the gears 3 or 4, Fig. 1, to the intermediate shaft carrying the two sets of gears 11, 12, 13 and 14, 15, 16, which are keyed into position on the shaft, and transmit the power to the series of loose gears 17, 18, 19 and 20, 21, 22 that are mounted to run one upon the other, as shown in Fig. 1. The gears 17 and 22, Fig. 1, run directly upon the shaft 2a that transmits the power to the table through the telescopic shaft 33, Fig. 4. This method of mounting insures long bearing surfaces for each gear and at the same time gives compactness to the mechanism. As the gears all rotate in the same direction, the motion between the bearing surfaces is a differential one due to the difference of speeds between the gears.

The variation of feeds is obtained by engaging the different gears of the series 17, 18, 19, etc., with the shaft 2a. The locking pin disc 23, Figs. 1 and 3, is keyed to the shaft 2a and carries a series of 6 locking pins, parallel with the shaft, two of which are shown at 24 and 25, Fig. 1, so arranged as to engage the various gears of the series, recesses being provided in the hubs of the gears to receive them. The position of these locking pins is controlled by the index disk 26 that turns on the locking pin disc 23 and carries a cam for operating the pinion levers 27, fastened to the ends of the small pinions, shown at 28, that engage rack teeth cut in the locking pins. The index disc is provided with a recess 29, Fig. 3, into which the pinion levers drop and allow the corresponding locking pins to engage the gears; and, as there is but one recess in the index disc, there is no possibility of engaging more than one feed at one time. The locking pin disk 23, Figs. 1 and 3, is figured 1, 2, 3, 4, 5, 6, on its periphery to correspond with the feed table; the index disk being plainly marked with 0 and provided with a series of holes to receive the adjusting pin.

The mechanism may be set for any desired feed by inserting the adjusting pin in any convenient hole in the periphery of the index disk and turning the index disk until the 0 coincides with the number corresponding to the feed required, as indicated by the feed table, remove the pin and turn the shaft until locking pin drops into gear. As shown in Fig. 1, the locking pin 24 engages the gear, 21, making it the driver for the shaft 2a and giving the No. 3 feed, shown on table 10, Fig. 2, which, with clutch 6 engaged, would be .008 "per revolution of spindle and with clutch 5, .044." In this case the 0 on the index

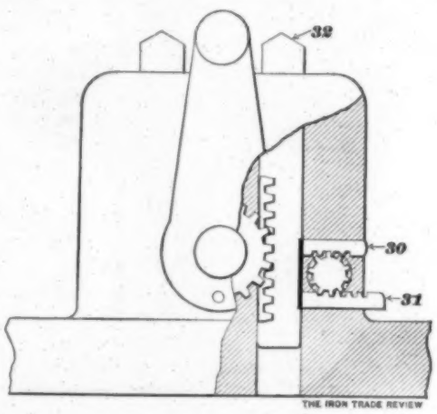


FIG. 5.

disk 26 would coincide with No. 3 on the locking pin disk 23.

The power is transmitted from the variable feed mechanism through the telescopic shaft 33, Fig. 4, to the gear case 34. This case contains the feed reversing mechanism, which is operated by the lever 35, the movement of which serves to start, stop or reverse all feeds. The levers 36 and 37, operate respectively the power vertical and the power transverse feeds.

To guard against accidents or breakages, which are inherent in any positively driven mechanism, a safety screw is placed in the telescopic shaft 33, which is intended to break under any unusual strain and prevent damage to the machine mechanism.

The feed tripping mechanism, shown in Fig. 5, is of the double plunger type. It can be set to prevent the throwing in of the wrong clutch, and is unusually sensitive. A feature much appreciated is that when the feed is tripped, it is not necessary to run the table dog beyond the trip pin to reverse the feed; it being only required to reverse the tripping lever. The two stop pins 30 and 31 control the movement of the lever as follows: The plunger 32 has a recess for receiving the pins, so that when pin 30

is pushed in the lever can be moved only to the left, as the pin will come against the shoulder of the plunger and prevent its moving down; with the pin 31 pushed in, the shoulder at lower end of recess comes against pin and allows the lever to be moved only to the right. When it is desired to feed the table in both directions, the pins are pushed in until both project an equal distance.

The table is heavy in proportion to the capacity of the machine, and provided with T slots sufficiently deep to insure strength. The arc through which the table can be swung is amply long; for example, on the No. 2 machine, this arc is 286 degrees. The power feeds can be used with the table set at any angle to 53 degrees, on the No. 2 machine, either side of zero; this is an exceptionally wide range and greatly increases the capacity of the machine for automatically cutting spirals.

The telescopic knee screw does not extend below the base, and the machine can be placed at any point upon the floor regardless of girders or foundations. The thrust of this screw is taken by ball bearings. In the clamping arrangement for the overhanging arm, one lever, shown at the front of the machine, 38, operates a shaft with rack teeth that engage the nuts on the clamping bolts, thus clamping both ends of the arm with one movement of the lever. The arm being a straight steel bar makes it possible to place any of the regular attachments in position without the necessity of removing the arm. Arm braces are furnished for tying the arm rigidly.

The design of this machine aims at the greatest efficiency, together with extreme accuracy and simplicity. The parts are so arranged as to be compact and easy of access; for example, the feed case is self-contained, and bolted to the side of the frame. It can be removed as a whole without disturbing any of the other mechanisms. For the sake of rigidity there has been such disposition of the metal as to avoid excess where not needed and when great strength is required the metal is suitably disposed. The uprights that support the spindle bearings, and the overhanging arm are solid and rigidly tied together by a brace forming part of the main casting.

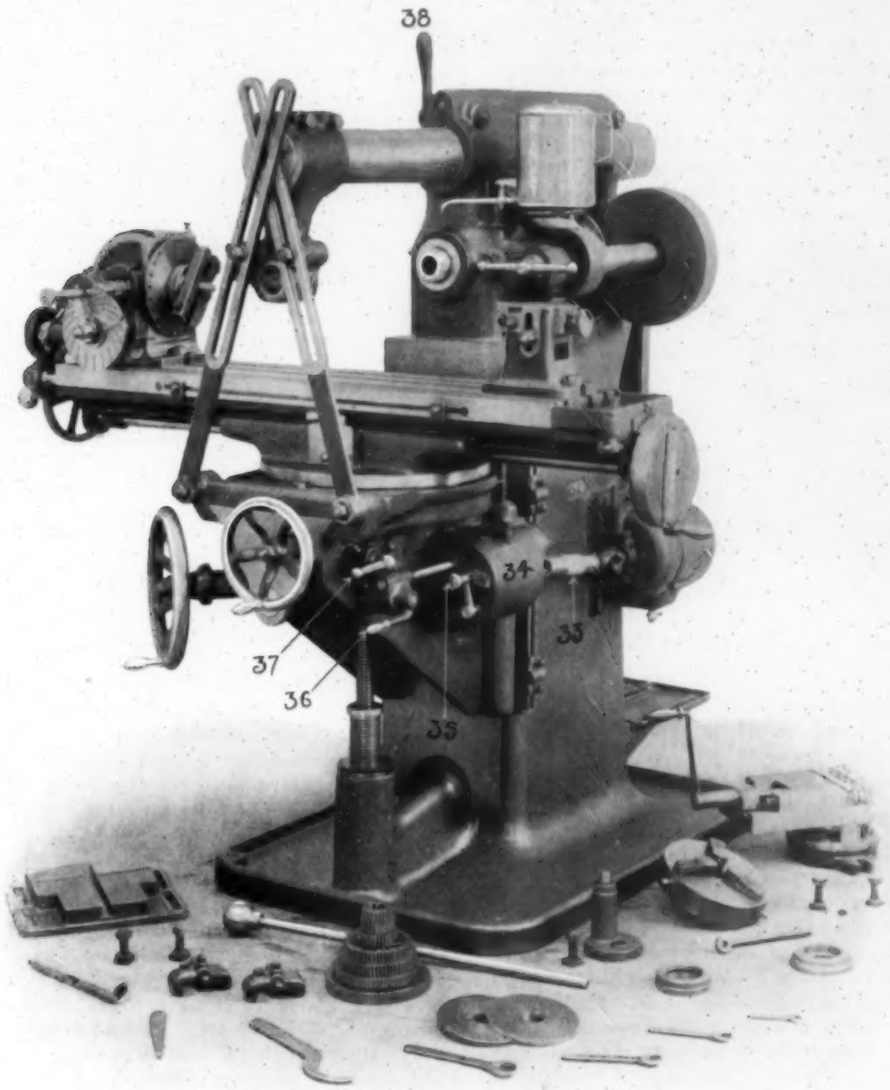


FIG. 4.—NEW UNIVERSAL MILLING MACHINE.

Differential Indexing.

This method of indexing has been applied to the entire line of universal milling machines built by the Brown & Sharpe Mfg. Co. It is much simpler than the compound method heretofore employed for obtaining divisions that are prime numbers and others not obtainable with the regular index plates. The indexing is obtained in the same manner as for plain indexing excepting that the spiral head spindle is geared to the index plate. It differs from compound indexing in that the movement of the crank at each indexing is positively modified by the plate, which is geared to the spiral head spindle and moves whenever the

crank is moved. The differential motion is thus obtained, allowing the indexing to be made with one circle of holes and the index crank turned in one direction the same as in plain indexing. This enables spacings to be made that cannot be obtained with an index plate locked in the usual way with the stop pin. In the compound method, it is necessary to exercise great care, as two circles are employed and it must be constantly kept in mind as to the direction in which the crank is to be moved, right or left.

In the differential method, however, there is little opportunity for error, as the index crank is moved the same as in plain indexing, it being only necessary to place the proper gears in position, as indicated by the table that accompanies the machine. This table is plainly and conveniently made up to include both plain and differential indexing and avoids the necessity of two separate circles. It gives all divisions from 1 to 360 and the proper change gears and instructions as to placing them.

As an illustration of the principle of the differential method of indexing, assume the index plate and spindle to be geared together in the ratio of one to one. The plate will then turn once while the spindle turns once. Therefore, if the plate turns in the same direction as the crank, and the crank is turned enough more than a complete revolution at each indexing to have the crank pin go into the same index plate hole, it will be readily seen that one turn of the crank will be in consequence of having followed the plate while the spindle has made one turn. Hence, the worm will have turned 40 turns in 39 indexings, which is equivalent to obtaining 39 divisions with equal gears and using only one hole in the index plate, the regular spacing number being 40 turns of the worm to one of the spindle. If the regular spacing number were 60, it would be possible to obtain 59 divisions with the equal gears.

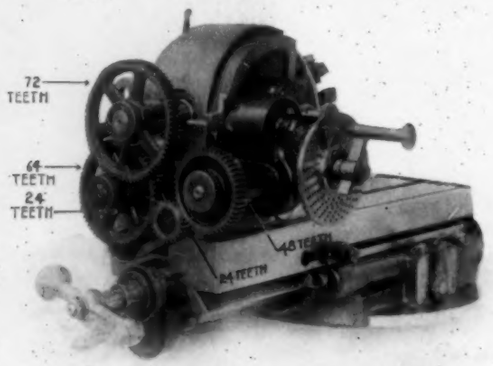


FIG. 6.—DIFFERENTIAL INDEXING MECHANISM.

The use of two idlers with the equal gears will rotate the index plate in an opposite direction to the crank. In this case, the crank, in making 40 complete revolutions, will meet the same hole in the index plate 41 times, thus obtaining 41 divisions by bringing the crank to the same hole in the plate at each indexing. It will, therefore, be readily seen that with only one hole in an index plate, it is possible, by gearing the index plate to the spindle in a ratio of one to one, to obtain 39 divisions with one idler and 41 with two idlers. With one idler, the spacing number is changed to 39 and it is possible to obtain divisions equal to 3x39 with a circle of 3 holes or 4x39 with a circle of 4 holes, etc. With the same gearing and two idlers, the spacing number is changed to 41. Any division not obtainable with the index plate can, therefore, be made up with proper gearing. To explain this method further, the following examples are given:

Required: 59 divisions, no index plate with 59 hole circle being at hand. First, set the indexing for 60 divisions, which is ⅔ turn of the crank at every indexing. With 59 indexings, therefore, there will be obtained 39⅓ revolutions of the worm, lacking ⅔ turn of the 40 required for one complete revolution of the spindle. With the proper gearing, ⅔ turn can be made up, the gears in this case being 48 on the worm and 32 on the spindle, with one idler. This will give the 59 divisions required, or, with two idlers, 61 divisions can be obtained.

In gearing the index plate to the work spindle, it is necessary sometimes to employ compound gearing, Fig. 6. As an illustration of this method of gearing, take 319 as the number of divisions required.

First, select some number of divisions that can be obtained with any index plate furnished with machine; for example, 290, which would require a plate with 29 hole circle, using 4 holes at each indexing, 4-29 turn of the index crank. Indexing 319 times, 4-29, the worm will be turned 44 times, this being 4 turns more than the 40 required for one complete revolution of the spindle. 4=the number of turns that the plate should make to one turn of the spindle. It can be expressed in the form, $\frac{4}{1} \times \frac{1}{1}$; and multiplying the first turn, $\frac{4}{1} \times \frac{8}{8}$, and the second, $\frac{1}{1} \times \frac{11}{11}$, the expression becomes $\frac{32}{8} \times \frac{11}{11}$. The terms of this fraction represent the teeth of available gears, the gears, 72 and 64, being drivers, 24 and 48 driven gears.

The proper arrangement of these gears is shown by the accompanying illustration. Gear on spindle, driver; gear on worm, driven, or the follower. The first gear on the stud is a driver, which drives the worm gear. The second gear on the stud is a follower, being driven by the spindle gear.

A collar is provided for use on the spindle to locate the spindle gear. In some arrangements of the gearing, this collar is placed outside of the gear next to the nut and in others back of the gear. For example: in compound gearing, it is placed back of the gear, bringing the gear out against the nut; and in simple gearing, many times it is necessary to place this collar back of the gear, for the reason that the gear may be so large that it will interfere with the gear on the worm sleeve. An example of this is shown in the gearing for 176 teeth. In this case there are two 24 tooth gears on the stud, making the gearing appear as if it were compound; but the two 24 tooth gears really act as a single idler, as they are on the same stud.

Spacing for One Quarter Degree: To space for ¼ degree, or 1440 divisions, first try an indexing of 1-33, which will give a spacing of 1320. It is sometimes found convenient to multiply the difference between the spacing required and the assumed number of space by the assumed indexing, which gives the gear ratio direct. Thus, the difference between 1440 and 1320 is 120, which, multiplied by 1-33, equals 120-33, the required gear ratio; that is, there are 120 spaces to gain. One spacing being 1-33 of a turn of the index crank and 120 spacings required, 120-33, is the number of turns of the index crank to one turn of the spindle. $\frac{120}{33} = \frac{40}{11}$. In order to express this ratio in a form that will permit the use of available gears, it is necessary to reduce it as follows: $\frac{40}{11} = \frac{200}{55}$, which can be compounded into $\frac{8}{5} \times \frac{25}{11}$. Multiplying the first term, $\frac{8}{5} \times \frac{8}{8}$, the result is $\frac{64}{40}$, and the second term, $\frac{25}{11} \times \frac{4}{4} = \frac{100}{44}$; and the ratio, or train of gears, becomes $\frac{64}{40} \times \frac{100}{44}$. In order to gain the required number of indexings, one idler is required to reverse the index plate in relation to the movement of the crank, which, combined with the compound gear stud, gives the effect of two idlers, for the reason that the gears on the stud act as one idler. The gears, 64 and 100, are drivers, and those with 40 and 44 teeth respectively are followers.

Fractional Spacing: As illustrating this application, assume that it is required to space a Vernier to read to 1-12 of a degree or 5 minutes; the Vernier to be used in connection with a scale divided to degrees. Usually the method adopted to accomplish this is to have the Vernier spaces occupy a distance corresponding to 11 degrees and to divide this into 12 parts or spaces, which may be expressed as follows:—

$\frac{11}{360} \div 12 = \frac{11}{4320}$, which is equal to one space. There would, therefore, be $\frac{4320}{11}$ spaces in the whole circle, or 392 8-11 divisions. Indexing of 1-9 or 360 gives the difference between 392 8-11 and 360 or 32 8-11 indexings to be obtained with the gearing. $32\frac{8}{11} = \frac{360}{11}$ indexings,

which, multiplied by the value of one indexing, 1-9, gives $\frac{60}{11}\times\frac{1}{9}=\frac{4}{11}$, the resulting gears will be $\frac{20}{55}$ or $\frac{44}{110}\times\frac{100}{44}$, one idler being required. It will be noted that the gears called for in this example are the same as those used in the one just previous.

Cost Accounts.*

BY A. E. SHOWELL, A. S. A. A.

The importance of the subject is very much increased by the redoubled efforts of foreign countries to capture our trade. If we are to retain our trade we must not only maintain our reputation for quality by keeping up our standard of excellence, and by taking full advantage of the labor-saving appliances and other such economies, but we must also be prepared to cut things very fine in the matter of selling price; and, in order that we may discover where economies can be effected and where we can cut down to meet competition, it is essential that great care should be exercised in ascertaining the cost of production.

The two prime factors in almost all costs are labor and material. I therefore propose to deal with my subject under those two main heads. The first point to consider is the drawing up of a system for accurately recording the time by the workman. The one which I believe is most usually adopted is the check, or tally system. The workman, on arrival at the works, passes a time office, and there receives from the foreman or timekeeper a metal tally with his number, which is taken from a board bearing the corresponding number. From this board the time keeper enters up his time sheets, recording by a mark those whose tallies have been applied for. In case of labor paid by time, and where the work people do not take meals in the works, the tallies should be deposited in a box each time on leaving the works, and then resorted by the timekeeper in readiness for their being applied for on the return from the meals, and the recording process again repeated. There are also systems of automatic time-recording machines, such as the Bundy, Day, Lelwellyn, etc., which are very effectual, and in some instances are to be preferred to the above-mentioned.

Preparation of Wage Sheets.

At the end of the week the timekeeper will total up the time made by each employe, and will fill in the rate of pay against each. This he will ascertain from a book which should be kept, wherein is a record of each employe, showing date of engagement, rate of pay and each successive variation in rate, after which he will make the calculations and sign the sheets as having prepared same and made the calculations. The various foremen or overlookers should then examine the sheets or book, and sign the same as being correct as regards time and rate for the employes under his control. The sheets or book will then be sent to the counting house to be checked by an independent clerk, and in order that any deductions, such as rent, sick fund, etc., may be made, and a check for the net amount drawn; or, as in many cases it is preferable, the check is drawn for the gross amount of the wages, and the sums deductible paid over to the cashier, and treated as ordinary receipts.

Where a workman is employed exclusively upon piecework, or even is paid day wage, and is solely occupied upon one process or class of article, it is a very simple matter to correctly charge off his time to that process of class of article; but where he is employed in various branches—take, for instance, an engineer, who, during one day may have done (a) repairs to the machinery pertaining to one process in the morning, and has been occupied (b) fitting up shafting for driving some new machinery upon the works in the latter part of the day; or, again, has been engaged until dinner time (c) upon repairs to a locomotive which has suddenly broken down, and for the remainder of the day upon work connected with (d) the manufacture of some article for stock—then very careful apportionment of the time spent will have to be made, so that the correct amount may be charged against each of the following: (a) Maintenance of plant relating to the particular process; (b) the works order relating to the cost of erecting the new plant; (c) the locomotive repairs account, and (d) the stock order number relating to the particular article.

In cases of this nature the employe must be provided with time boards or slips, whereon to record, at the completion of each job, or when employed upon one job the whole day, then at the end of the day, the nature of the work, or where there is one, a works or stock order number (to both of which I will refer later) and the time occupied. This should be initialed by his own foreman or by the foreman of the department where the work has been done. In the case of overtime, where higher rates of pay obtain, special record will have to be made of time thus spent upon the particular job. This is important, not merely from the point of view of the preparation of the wages sheets, but in order that a record may be made of the extra expenditure incurred, so that the principal may be able to judge as to the real necessity of such addition to the cost.

Analysis of Wages.

These time boards or slips will be collected each day and entered up by the clerk whose duty it is to prepare the analysis, either on rough sheets, or for preference, in a waste book ruled across with money columns, using a page, or portion of a page, for each separate process, branch of manufacture, works order or stock number to which the items are chargeable, the cross columns being used for the different classes of workmen employed upon it.

The time clerk will, at the end of the week, i. e., the end of the period for which wages are made up, after casting the analysis, enter the same either on loose sheets, which can be press-copied in order that he may retain a record, if he has to send same from outlying works, or in a ruled book if the works are concentrated. The gross total of these sheets will, of course, agree with the amount of the weekly wages paid.

Where the nature of the business requires the cost books to be entered up weekly, the summary of analysis sheets can be used for the purpose of posting direct to the prime cost ledgers, being either pasted into guard books or filed in some convenient manner; but when monthly quarterly or half-yearly statements of cost are sufficient, much labor may be saved by entering the sheets up week by week in a wages journal, with printed heading down the side for all constant accounts, such as maintenance of plant, repairs and renewals to buildings, locos, wagons, etc., and with the necessary space for exependiture upon works order numbers, stock numbers, and then five, thirteen or twenty-six money columns for the weekly amounts, a total column, ledger folio and remarks.

I now turn to the other principal factor in Cost Accounts, viz.:

Stores.

It is of equal importance that there should be a system for the accurate recording of all transactions, whether requisitions, orders, prices, consumption or stocking of stores. Assuming that there are several sections or branches connected with the work, each of which has its seperate stores department, it will be the duty of the chief of each section or department to make out periodically, say weekly, a requisition to the head office for his estimated requirements, sufficiently far ahead to enable their being purchased, in case no stock is on hand at the chief stores. The forms are most convenient, I find, bound in books, paged and perforated, with manifold copying sheets interleaved.

The forms should show in columns, in addition to full description of the article or material, the quantity required, the purpose it is required for, when required by, and also for the guidance of buyers, the date of last supply, and by whom supplied, and a column for remarks. In some firms the requisitions themselves are put before the principals, but to my mind it is more convenient to have them entered

*Abstract of a lecture delivered before the English Incorporated Society of Accountants and Auditors.

up in a requisition book, and especially if several of the departments and branches are using similar materials; by so doing the various classes of materials can be grouped in entering up the requisition book, and the principal or buyer can see at a glance the total quantity of each commodity required throughout the whole works. The requisition book therefore should have additional columns, showing firm goods are to be obtained from, number of order, quantity ordered, rate, date received and reference to invoice.

The goods having been ordered, manifold order books being used, the number of the order and other details will be entered up in the requisition book. In cases where the cost accounts for each works, branch or department are kept separately by them, it will be advisable, and in fact necessary, to obtain separate invoices for the quantity of goods sent to each, as much inconvenience and delay would be occasioned by sending an invoice from one department to another for them to mark off their portion.

If the cost accounts, however, are all kept at the head office, one invoice is quite sufficient; but it will be necessary for the branch storekeeper, on receipt of goods, to send in an advice form to the head office, giving quantities, and with any remarks as to quality and condition. When the invoice clerk at the head office has marked same off, he will fill in the blank columns on the advice form, the invoice number, firm supplying, rate and value, and return the advice for the departmental storekeeper to complete the necessary entry in his stores received book.

Invoice Book.

When the inward invoice clerk first receives the invoice from the vendors, he will number it, and enter the name and amount of same, after deducting trade, but not cash discounts, in a column for "amount of invoice as received" in the stores invoice book. After the advices have come to hand from the various departments that have received the goods, and the various quantities traced and agreed, and the rates and extensions checked, he will enter the amount for which the invoice is passed in a column for that purpose. This may or may not agree with the "amount as received" column, according as there has been any correction made in the invoice.

This amount will be posted to the credit of the individual firms, and to the debit of a general stores account in the commercial ledger. It may be a convenience to have the right hand side of the opening ruled with analysis columns, so that the amounts relating to each works or department may be entered in separate columns as a check on the departmental stores account, and to facilitate the localization of errors in the works books.

The "stores received" book should be ruled with columns for recording the date, number of invoice, firms supplying, description and quantity of goods, rate, amount, and also stores ledger folio. The amounts will be posted from this book to the debit of the account in the stores ledger for the particular material.

The stores ledger for department is much the same as the commercial ledger, save that the accounts are with the different classes of materials instead of individuals. Both sides of the account should be ruled for description of goods, rate and amount, whilst the debit or "received" side will, in addition, have space for name of firm supplying goods.

If the material is received by transfer from another department, or from the chief stores, or if it is material which has been previously issued and returned for any reason, or if it is material recovered from plant, then, instead of name of firm supplying, the transfer or returns advice number (which I will deal with later) should be entered.

Issue of Stores.

I will now deal with the issue of stores by the storekeeper. No goods should be allowed to be issued except on a written order from the foreman or manager of the department or branch requiring the same. These orders should be numbered consecutively, and a duplicate retained by the foreman ordering the stores. When the stores are issued, the storekeeper must obtain the foreman's signature to the order form as having received the goods. The order should state distinctly for what purpose the stores are required, i. e., for some process of manufacture, maintenance of plant, buildings, works order number, or stock order number, as the case may be. Cases may arise where stores issued for one purpose are eventually used, for some special reason, for another purpose altogether. In such instances the foreman must immediately advise the storekeeper, who will enter such to the credit of the account which was originally debited, and debit the account for the job to which the material was actually applied. Every effort should be made to reduce such cases to a minimum, or errors will creep in.

The storekeeper will record in his "stores issued" book the full details of the material issued, and from this book he will post the quantity and value to the credit of the account in his stores ledger for the particular material so issued. He will then prepare a periodical analysis, according the the requirements of the business, and to coincide with the period for which the wages analysis is prepared, and send the same to the head office for filing and posting to the prime cost ledgers; or the foreman's orders themselves, with the acknowledgment of receipt of goods duly signed, after having been dealt with and initialled by the storekeeper, may be sent to the head office and used as the source from which the debits to prime cost arise. In the former case, where the analysis of the stores issued is prepared by the storekeeper, the door is perhaps rather left open to the store keeper, to so adjust his summary of analysis as to cover any irregularities that may have been going on, and it would be desirable, in fact necessary, to periodically test the accuracy of his analysis.

Work Orders and Stock Orders.

It is most advisable that a fixed rule be made that no general expenditure, such as maintenance or repairs, alteration or addition to plant, exceeding a certain sum, say £25 or £50, should be put in hand by the foreman or departmental manager without the preparation of an estimate which should be submitted to the principal, and when approved by him a works order, bearing a distinctive number, should be issued for the work to be done. As I mentioned just now, in dealing with wages, and again with stores, all expenditure on account of that job should be booked by the storekeeper or wages clerk to that particular number.

In works where articles such as boilers, cranes, wagons or such like are manufactured, or with smaller articles where a certain number are being made for stock, a stock order should be issued by the principal or manager to the department or departments, to make the same, and for the purpose of ascertaining the actual cost of the particular article, part or group of articles, all wages expended, or stores issued for the same should be booked to the stock order number.

In the case of works, where processes are continuously carried on, such as chemicals, glass, salt, iron and such like, the wages and stores will be charged off to the particular process, quality, section of work or other subdivision which the nature of the business requires.

It may be well to mention here that stores issued by the chief stores department to departmental stores should be merely treated as transfers. The storekeeper issuing such should enter the quantities and values in his stores issued book (or if the transactions are frequent, in the case of departments, a separate book for transfers may be kept), and post to the credit side of his stores ledger. He should also send to the department receiving the goods a stores transfer, with full details of quantities and values. After verifying same, the receiver should enter in his stores received book, or transfer book, in the same way as if the goods had been received from outside merchants, but quoting stores transfer number in place of the name of the merchant, and then return the transfer, signed and dated, to the issuing department. These transactions being merely departmental, need not be recorded at the head office unless, as before stated, all the clerical work is done there.

There will also arise cases, even in the most carefully

prepared estimates, when an excess of material is applied for, and a rule should be made that the surplus must in all cases be returned to the storekeeper. There will also be in many trades scrap material and unsuitable or spoiled articles or material which must be returned to the stores; or, in the case of scrap, come under the control of the storekeeper, although not actually deposited in stores. A form similar to the stores transfer should be sent by the foreman, returning such to the storekeeper, giving particulars of the job for which the material was originally issued.

With regard to scrap, the question of pricing presents, at times, a difficulty. But the system I find most effective is to fix a standard for all the usual classes of material, which can be revised periodically by the head office, as the market for such fluctuates. In such cases the storekeeper must enter the quantities and values in his stores received book in the same manner as in the case of transfers, and after having made such entries send the form to the head office, so that it may be correctly dealt with by the costs clerk, or the advices themselves may be sent to the head office direct and treated as quite distinct from ordinary stores.

Fuel and New Material.

There are, of course, cases where wages and stores are not the largest factors in cost of production. Take, for instance, the works with which I am connected, where fuel is the largest, and consequently one of the most important items in the cost of production. In such cases it is necessary to have a complete system whereby the coal, or other raw material, received in bulk, and which cannot therefore be passed through stores, is charged off to the particular set of works where it is to be used.

Returns must be sent in to the head office, giving the name of sender, name of vessel or number of truck, gross tare and net weight, remarks as to quality, etc. If any portion is used for other purposes than the actual process of manufacture—say, for instance, coal for locomotives, steamers, offices, cottages or other distinctive purpose—a periodical return must be made to the head office, so that the same may be dealt with in the proper manner.

A register of fuel—or other raw material, whatever it may be—will have to be kept, with columns for date advised, date received, number of advice, name of colliery or merchant, number of wagon or name of boat, weight advised, weight received. The book for the head office will, in addition, require columns for pit price, railway rate, delivered price, and then also analysis columns for weight and value, with headings for the various branches, departments or processes.

The fuel invoices will be entered in a book, similar to the stores invoice book already described, with analysis columns. The total of the fuel invoice book will be posted periodically to the debit of the fuel account for each works, or to a general fuel account, which account will be relieved by the analysis of the fuel received book, the amounts, and if necessary, quantities, being charged off to the various processes in the prime cost ledger or to the expenses accounts, such as locomotive running, craft working, offices, etc., in the impersonal ledger.

Prime Cost.

Having dealt with the main items which go to make up prime cost in most factories, up to the time of the receipt of advices by the head office, where I am assuming the cost accounts are being kept, and with the necessary books for recording these advices, I will endeavor to explain in a general way the method of dealing with the same in the prime cost books.

First of all, let me submit to you suggested rulings for prime cost ledgers. The rulings suitable for one trade are, of course, not necessarily applicable to another; but, speaking generally, one or other of these forms will be a guide, with certain modifications in most cases. (1) For works where an article or number of articles or parts are made to a stock order number. (2) In works where processes are being carried out and material being manufactured.

First.—The wages, after having been dealt with as already described, will be posted, either weekly direct from the analysis sheet sent in by the various departments, or periodically from the wages journal, to the debit of the accounts to which its items relate, and under the various subheadings showing the different classes of workmen, if deemed necessary, in the prime cost ledger. The total will, of course, be posted to the credit of wages account in the impersonal ledger, and per contra the wages checks which will have been posted to the debit of that account. In the case of general items, such as maintenance of plant, repairs to buildings, etc. (except when chargeable against a process or the manufacture of some regular and exclusive output), will not be posted to the prime cost ledger in the first instance, but to separate accounts in the impersonal books (which can be ruled to record, if necessary, on the self-analyzing principle), afterwards to be dealt with by apportionment over the various stock orders, etc.

Second.—As in the case of wages, the debits for stores used can be posted to the prime cost ledger, either weekly direct from the stores used analysis sheets (or the stores orders themselves), or these analysis sheets may be summarized in a store journal similar to the wages journal and posted periodically (monthly, quarterly or half-yearly), as the circumstances of the trade would indicate to the debit of the respective accounts in the prime cost ledger, and the total to the credit of the general stores account. The transfer forms relating to returned stores or scrap will have to be journalized, and the items posted to the credit of the various accounts to which they relate, in the prime cost ledger. The debits will be posted to the general stores account; or, if a separate account is kept, then scrap will be posted to the debit of such in the impersonal ledger.

The expenditure upon works orders (i. e., special expenditure upon works, for which an estimate has been prepared and passed by the principal) should be very closely watched and totaled up week by week, and when the amount is approximating the total authorized by the works order, the principal should be informed by the costs clerk.

Third.—Fuel or other raw material, received in bulk and not passed through stores, is treated as separate and distinct from ordinary stores, and will be posted to the prime cost accounts periodically, in the same way, from the fuel or raw material received book or from the invoice books themselves, if kept on the self-analyzing principle. In such cases it is advisable to post the quantities as well as values, so that the consumption of coal, or other raw material, per ton of the manufactured material produced, may be ascertained. This is of course a most important point.

Fourth.—Maintenance and other expenses not directly or exclusively connected with and chargeable to the cost of particular articles will have to be apportioned over the various stock orders, etc. In the case of processes, the actual cost of the maintenance of plant, repairs to buildings, and such like, can usually be ascertained, as a distinct set of buildings, or part of building, and separate and special plant are usually employed. But in cases where several classes of trade are carried on under one roof, and the same plant is being used for various stock orders, etc., the apportionment of the cost of up-keep and running must be approximated. It is impossible to lay down any rule as to the best method of apportioning indirect charges, it being a very much debated point, and one which in itself would require more than the limits of this paper to give anything like adequate consideration. As a rule, however, one or other of the following bases are usually employed:—

Sales value of articles produced.
Sales quantity of articles produced.
Wages expended on articles produced.
Wages and stores expended on articles produced.
Time employed on articles produced.
Estimated life and value of machinery employed in producing.

Similar bases may be adopted in apportioning the wages of foremen, timekeepers, etc.

"Stock Orders" Prime Cost Ledgers.

In the case of my specimen ruling for prime cost ledger

that relating to stock orders, and articles for stock, as distinct from processes or bulk goods, the finished articles will be credited to the account when transferred from works and taken into stock at warehouse, as distinct from stores. Stock and stores must be kept quite distinct, and must not be confused. When completed articles are sent into warehouse, whether they have been manufactured for a special order or for general stock, a warehouse transfer form should be made out by the departmental foreman, giving the full particulars as to weight, etc. The rate and value will then be filled in by the prime cost clerk, and the transfer sent to the warehouseman, who will allot a warehouse number (as distinct from stock order number) and will be entered in the stock books. The costs clerk will enter the goods and value to the credit of the account for the particular stock order number, or the account for the particular class of article in the prime cost ledger, recording also the warehouse number allotted.

In the other case, it is practically only a debit ledger, the space at foot for credits being merely for adjustment of overcharges in wages, returned materials, and so forth. The real credits for sales are, in this case, better abstracted from the sales journals, which should be ruled on the self-analyzing principle, giving quantities, as well as values, of each material. In abstracting the sales it must, of course, be borne in mind that the stocks at the commencement of the period will require to be deducted, and the stock at the end of the period added, in order to ascertain the make to which the figures in the prime cost ledger apply.

Cost Sheets.

These can be complied at intervals, as the exigencies of the particular trade demand, columns being ruled for the average cost per ton of each part of the process, which can be subdivided to any extent, according to the detail posted to the prime cost ledger from the subsidiary books. Columns may, if thought advisable, be also provided for the standing and general charges, rents, rates, management expenses, travelers, bad debts (estimate), advertising and carriage, if included in selling prices. These items will be taken from the various accounts in the impersonal ledger; but as they are mostly of the nature that are unaffected to any appreciable extent by the volume of business done in any particular period, there is no real reason for considering them in comparative costs.

There is just one other matter which I would call attention to, and that is the system in vogue at some factories, what I might call the Estimate Cost System.

It is adaptable to works where there is a regular steady output of certain articles, packets, boxes, etc. The principal prepares a very carefully detailed estimate, which he enters in an estimate book.

Assume the estimate is for 100,000,000 cigarettes in packets of ten. He heads his estimate book with this quantity. The book has columns for tobacco, paper, packets, boxes, each with weight or number, rate and value; also columns for the various classes of wages and expenses, and total prime cost. He calculates exactly the weight of tobacco which will be required for making this quantity, and prices the same at the rate then ruling, or makes allowance for a probable rise or fall in market during the period of manufacture. The same applies to the other material.

If the wages for the various processes of tube making, cutting, machining, boxing, etc., are paid piece work, the calculations for them will be simple; but, if day wage, he will have to make a careful estimate of the probable output of the person or persons engaged in each process, per hour or per diem. These estimates are totaled on a cost sheet as the quantity under each estimate is produced. The sales are also abstracted from the sales journal periodically, giving quantities and amount. A column is provided for estimated average discount and the average net amount realized.

To the costs, as per the estimate, is added the miscellaneous expenses, estimated on the same lines as I referred to just now in dealing with the processes costs sheets. The total cost (estimated) is then ascertained, and the net profit or loss shown. These cost sheets are periodically summarized in the form of a trading account, and a comparison of these will often lead to the detection of error, either in estimates or in the account. In preparing the trading account for comparison, care must be taken as to adjustment of stocks.

Marietta Sheet & Tin Plate Co.

The Marietta Sheet & Tin Plate Co., of Marietta, O., expects to be in full operation Jan. 1. The main building, which is 120x300 feet, is a substantial frame structure covered with corrugated sheet iron. Part of the machinery has already been installed. A 20-ton traveling crane was furnished by the Case Mfg. Co., Columbus, O.; the electric lighting plant and motors by the Northern Electric Co., Madison, Wis.; shears and other machinery by the Wheeling Mold & Foundry Co., Wheeling, W. Va.; the engine by the Newburgh Foundry Co., Newburgh, N. Y.; the furnaces by Edward E. Erikson, Pittsburg, and the boilers by Erie Iron Works, Erie, Pa. The tin house and finishing department, 50x180 feet, is not yet under roof but will be ready early in December. The contractors for foundations and buildings are Bush & Bodine, Cambridge, O. The officers of the company are: M. F. Straus, president; Lakin C. Taylor, of Cambridge, O., secretary; A. P. Bronson, formerly manager of Cambridge plant of the American Tin Plate Co., treasurer. David Llewellyn, formerly of the American Tin Plate Co. at Middletown, Ind., is superintendent. The plant will be thoroughly modern, splendidly equipped and up to date. It is located on the line of Pennsylvania tracks. The Marietta Electric Railway Co. has extended its line to the plant.

Pennsylvania Co.'s Heavy Rail and Equipment Needs.

The iron and steel business, particularly the structural branch, will be benefited to a large extent by the expenditures to be made by the Pennsylvania R. R. Co. during the next two years. The amount of steel that will be required for the New York tunnel and terminal and the Jersey City piers, will be enormous. As the congested condition of the Pennsylvania Co.'s traffic is due largely to lack of side tracks, it is expected that a large proportion of the money appropriated for improvements, additions, etc., will go toward the purchase of rails. A representative of one of the largest steel rail mills in the country figures that the output of steel rails next year will be in the neighborhood of 3,300,000 tons. He adds that a market could be found for 1,500,000 tons more than the mills will be able to produce next year.

At a meeting of bicycle manufacturers held in Cleveland Nov. 21, preliminary steps were taken for the revival of the Bicycle Manufacturers' Association and for the reorganization of the American Bicycle Co., which is now in the hands of a receiver. In addition to the lifting of the receivership, the plans call for the investment of about $2,000,000 in addition to the capital now invested. Among those who attended the meeting were: Col. A. A. Pope, of Boston; G. A. Pierce, of Buffalo; H. S. Masten, of Syracuse; Frank Fries, of Buffalo; Ezra Kirk, of Dayton; F. E. Southard, of Toledo; H. E. Schwinn, of Chicago; Harrison Williams, of Waltham, Mass., and A. L. Garford, of Cleveland.

The new foundry of the Diamond Drill & Machine Co., Birdsboro, Pa., is rapidly nearing completion and the first cast will be made in the open-hearth furnaces shortly. The main foundry building is 360 feet long with leantos 220 and 300 feet each. The entire width of the foundry is 250 feet. Several furnaces have been erected to furnish the steel for the steel castings and the cupola capacity for iron castings will be very large. Two machine shops have been erected the one 80x175 feet and the other 40x80 feet. The steel foundry will be commanded by two 25-ton cranes and two 15-ton cranes while the iron foundry will be commanded by a 30-ton crane. The machine shops will be commanded by a 16-ton and a 10-ton crane respectively. The Pottstown, Pa., plant of the McClintic-Marshall Construction Co. has the steel buildings under erection.

The Pittsburg Foundrymen's Association.

The regular monthly meeting of the Pittsburg Foundrymen's Association was held on Monday evening, Dec. 1, at the rooms of the Engineers' Society of Western Pennsylvania. The following members and visitors were present:

Chas. W. Winder, George Niehaus, B. D. Fuller, Wencel Bavurka and C. F. Knowlton, Westinghouse Electric & Mfg. Co.
S. D. Sleeth and J. A. Schick, Westinghouse Air Brake Co.
Wm. Yagle, Wm. Yagle & Co.
C. A. Stroh, Mr. Kenney and Timothy Hurley, American Locomotive Works.
H. M. Wilson and R. F. Barker, Taylor, Wilson & Co.
Jacob Lane, Keystone Car Wheel Co.
James Saville and D. P. Thomas, Sterrit-Thomas Foundry Co.
D. B. Adams, Hydraulic Machine Co.
J. S. Seaman, W. H. Nichols and E. Wentz, Seaman-Sleeth Co.
Daniel Ackerman, Hunt Foundry & Machine Co.
John Scott and C. W. Townsend, Thos. Carlin Sons Co.
J. S. McCormick and T. E. Malone, J. S. McCormick Co.
E. D. Frohman and E. G. Seaman, S. Obermayer Co.
Geo. Knotts and James Keegan, United Engineering & Foundry Co.
Mr. Dunlap, Mackintosh, Hemphill & Co.
G. D. Springer, Pittsburg Pulley Co.
John McLaren, Phillips & McLaren.
E. A. Kebler.
S. H. Stupakoff, The Fullman Co.
A. O. Backert, *The Iron Trade Review.*
R. A. Walker, *Iron Age.*
F. H. Zimmers, Union Foundry & Machine Co.
Mr. Clark.

Manufacture of Bituminous Facing.

The following paper was read by E. D. Frohman, of the S. Obermayer Co., on the nature and manufacture of sea coal facing:

Sea coal, stone coal, or bituminous facing is one of the most important commodities used in the foundry, but still one of the cheapest. The names sea coal, stone coal, and bituminous facing are all applied to one and the same thing. "Sea coal," the name applied to a soft coal, was first discovered near the sea, when found in earlier days in England, and even today it is mined in Wales far under the bottom of the sea. The American foundrymen in earlier days believed that this material should be made from this sea coal, and from this comes its name. "Stone coal" is a misnomer and was used by the Welsh foundrymen, who called all coals stone coal; but really in this country the name was applied to anthracite coal. "Bituminous facing," or ground bituminous coal, is the proper name. The best material is made from high gas coals of Westmoreland County. In fact, the products of these mines are used by various manufacturers of gas and by the larger steel works to make producer gas.

Often the Western coals have been used in cases of emergency for the grinding of bituminous facing, but the coals mined in the Pennsylvania district are best adapted to this purpose. The farther West we go the higher the ash of the coal. Starting in the far East with anthracite we have a 5 percent ash; Western Pennsylvania, from 5 to 10 percent; Ohio, 10 to 12 percent; Indiana and Illinois, from 12 to 14 percent; and the far West produces lignite with ash as high as 40 percent. However, in the West we find coal that has ash running from 10 to 12 percent, but never anything like the Westmoreland coal, with the exception that here and there in Colorado and Washington some good mines are found.

The speaker begs to say that there are few anthracite deposits. We may ask how does this concern bituminous facing? Simply as showing that the higher the gas and the lower the ash, the better the facing.

Sea coal or bituminous facing is mixed with sand to peel the castings. Many theories have been advanced as to this. Some say the gas burns vents in the mold. Again we are told that this procedure prevents the solidifying of the sand. Proof is given by applying heat to fuse the sand containing aluminum or sodium silicates. The material will fuse. It is then shown that if you add pulverized coal, a coking of the coal requires an intenser heat to effect a fusion. A better and more logical reason for the use of this material was advanced just a few days ago by one of our most prominent foundrymen, and the practice really advanced the theory. He states that all sand contains vegetable and animal matter. The gas of the coal ignites the particles and prevents the clinker caused by this animal or vegetable matter from sticking to the iron, and therefore peels the casting.

The coal, in order to get the best results, must be ground fine and uniform. And in grinding great care must be taken not to have too high a temperature, lest the gases, which are quite essential, be driven out. For this reason, in manufacturing these goods, it is necessary not only that the coal be high in gas, but also be of the coking variety. Sea coal should be ground to about the texture of the molding sand. If a fine sand is used, so the sea coal should be; and where coarse sand is employed on large castings, the sea coal should be ground accordingly.

The Brazil block, which is found in Indiana, is high in gas, but can not be coked, and is therefore valueless as a means of manufacturing sea coal. The material is best manufactured in the following way: The coal is dumped into a large pit and conveyed by elevators to a crusher; thence to a washer and washed free from sulphur; then passed to a dryer, where the greatest care is taken not to heat to too high a temperature, but just enough to drive off the moisture; then conveyed to a set of burr mills to grind to a still further fineness, and then screened to the various degrees the trade may desire, for the different sections of the country.

In one of the English books on foundry practice, it is stated that facing should be free from adulteration. With what could one adulterate, to be cheaper than coal? Of course, slack could be used where a cheap quality is desired, but where a moderate price is paid nut coal is the cheapest and best material and offers the best advantages to the foundrymen.

For different localities, different amounts of fineness are requisite. In some places, especially in the East, the goods can be of such fineness that they pass through a No. 20 mesh, which is satisfactory and gives the best results. Different grinding is required in different districts, and this on account of the loam found in the sand; but the writer does not wish to go on record with the statement that the fineness of the coal depends on the amount of loam. However, where fine castings are made, bolted sea coal is used. The material passes through a No. 14 silk bolting cloth, and is as fine as flour. This is especially used for radiator work, and of course the cost is in the manufacture. Where castings are small and the sand fine, the amount of sea coal used is very light, and it must be of the bolted variety to give the best results. The amount of sea coal varies. We claim 10 shovelsful of sand to one of sea coal will do well for heavy work. When too much sea coal is used the castings have a checkered appearance, a spider work effect. The reason seems to be that the gases find their way through the ridges of the sand, and along the outside of the iron.

As to the composition of sea coal, it should be as free from sulphur and slate as possible, high in carbon, high in volatile matter and low in sulphur nad phosphorus.

In this connection a bit of experience may be given: Some years ago while in Kansas, I received a letter from our Chicago office in which one of our customers complained of our sea coal. I rode four hours on the cars to meet the writers, the tone of their letter being somewhat amusing. Had I stolen a horse or robbed a bank, I could not have received more abuse in two minutes than greeted me on presenting my card. When the foundryman finished his tirade, I said: "My dear man, what's the trouble?" "Trouble? It's all trouble. Your sea coal washes; I can't hold it on the face of the mold. I used about $1 worth of nails a day to keep your sea coal from washing." I advised him to be calm while we went out in the foundry to locate the trouble. On the way I saw the worst looking casting I ever beheld. My astonishment was greater when I saw the molder shoveling sea coal on the face of the mold, and then sticking in nails with the heads up—as he explained it, "to keep the sea coal from washing." I

showed him and his employer how to use sea coal, mixing with the sand, and how to use a blacking on the face, and from that time on we were good friends.

Foundry Facings.

The following paper on "Foundry Facings" was read by T. E. Malone, of the J. S. McCormick Co., of Pittsburg:

Foundry facings are very essential in the making of castings. It is only a few years ago since the foundrymen discontinued making their own facings and their manufacture is now a business in itself of no small magnitude. A great deal of trouble is caused in a foundry by the lack of knowledge as to the physical qualities of facings. Foundrymen invariably want to know the analysis of iron or coke, but are quite well satisfied to use a facing which looks to be all right, and on representation of a salesman that he can buy just as good as he is using or better for less price than he is paying. It very often happens that the salesman has no more idea of the material that he is selling than his customer. The material may be satisfactory or not, but if the work that the facing is intended to do does not prove satisfactory, it is without a doublt blamed on the facing.

If foundrymen would endeavor to learn more about the facings they are using, less trouble would occur. I would suggest that when a foundryman is using a certain kind of facing which gives satisfaction, that he have a chemical analysis made of it and use this as a basis, and if any trouble occurs which he thinks may be attributed to the facing, have an analysis made and find out if it is uniform and equal to the sample that was analyzed. I do not want to imply that in securing a material from a manufacturer of facings, of like chemical analysis to that in use, the same results can be obtained unless the ingredients are known. This would be an absolute impossibility, as every facing manufacturer has his own formulas.

I will first take up the matter of sea coal facing, also called bituminous and stone coal, which of course is used very extensively and which naturally varies a great deal according to the kind of coal that it is made from. The State geologist of Indiana claims that Pittsburg coals vary from 91 to 96 percent of combustible matter and vary in sulphur from .45 to .82; Indiana and Ohio coals contain 82 to 88 percent combustible matter and vary in sulphur from .61 to 4 percent; West Virginia coals contain 90 to 91 percent combustible matter and vary in sulphur from .46 to 2.25. It would seem from these variations that no particular rule could be followed out in regard to the amount used in making sand facing. There is also a great deal of difference in sand. Of course the majority of foundrymen are satisfied to simply guess at what they think would be sufficient, but I am quite certain that better results could be obtained if an analysis was made of the sea coal facing and the facing sand mixed in accordance with the amount of combustible matter the coal facing contains. I have prepared a table taken from foundries in and around Pittsburg in order to show the difference and the manner of mixing facing sand:

	Thickness	Amount of Sea Coal	Sand	Proportion of Sand
No. 1	¼ in.	1-12	Ohio	⅓ old, ⅔ new
	1 in.	1-10		
	above 1 in.	1- 8		
No. 2	½ in.	1-10	Ohio	60% old, 40% new
	above ½ in.	1- 8		
No. 3	½ in.	1-14	⅓ Pgh.	
	1 in.	1-10	⅔ Ohio	100 lbs. old, 40 lbs. new
	2 in. and above	1- 7		
No. 4	2 in. and above	1- 7	Penna.	⅔ new, ⅓ old
	lighter work	1-12		
No. 5	½ in. to 2 in.	1-12	Conneaut	63% old, 37% new
	2 in. to 6 in.	1- 9		

You can readily see from the above that there is no uniformity, and uniformity is impossible, as no two of these foundries make the same kind of work, but the general idea of mixing is about the same according to the thickness of metal. Nearly all of those I called upon have a standard mix for preparing the sand but without any idea whatever of the physical conditions of the facings. You know from experience that no matter how careful a man is in mixing that he cannot get the sand thoroughly mixed. I know that a great deal of trouble arises from this source. The foundryman when his castings do not come out satisfactorily, simply says that he is using the same sand and has the same men and the results should be as good as before; as a natural consequence the facing is to blame. This is as far as he goes. It is needless to say that uniform grinding is necessary in the manufacture of coal facings and that it be ground to suit different classes of work. I take the opportunity of mentioning that a great many up-to-date foundries are using sand mixtures in preparing their facing sand; by this means they are able to mix the sand thoroughly which is an impossibility by hand. They also save a great deal of time.

Plumbago is another very important facing used in the foundry, and it is probably unnecessary to mention how many different kinds of plumbago can be made from the same article. The question of quality is regulated according to the price obtained. It very often happens that a cheap quality of plumbago will do the work as satisfactorily as the best, but the principal trouble seems to be that unreliable manufacturers do not sell a uniform plumbago to the foundrymen no matter what price they may pay. If this material was to be put on the same footing as mentioned regarding sea coal facing, I believe that the foundrymen would be able to secure better goods. The best plumbago comes from Ceylon and is mined in the same manner as coal and graded into lump, chip and dust; coal being graded into lump, nut and slack. The chip and dust being used for facing; the lump is used for making crucibles. The mining season is very short owing to the monsoon or rainy season which lasts for several months and the mines become flooded. The natives have not been educated to use steam; in fact they are very much afraid of it and the pumping is done entirely by hand, thus making this commodity very expensive.

There are several grades of plumbago mined in other countries but they do not give the satisfaction that Ceylon lead does. Plumbago is used principally on green sand work and is sometimes used on cores, dry sand and loam work. Ceylon plumbago when prepared is the best material that can be used on green sand work on account of its natural condition which enables it to be put on the mould with a brush, through a dust bag or by hand and afterwards slicked with a tool; but for cores and dry sand work of all kinds, also loam work, I believe that certain grades of blackings now manufactured give better results. These blackings contain a greater percentage of carbon than plumbago, which makes them more refractory. The largest and best foundries have discontinued using plumbago and its numberless aliases for this class of work and are using high-carbon blackings.

A great quantity of soapstone or talc is used in foundries. There is some difference in the formation of crude talc and soapstone, but when ground very little difference can be detected. Talc when taken from the mines has the appearance of chalk and can be easily broken and is more or less refractory, whilst soapstone is of a fibrous nature and very hard, thus making it one of the best known minerals for use in a foundry. These minerals are obtained in nearly every State in the Union, but the best soapstone for foundry purposes is mined in the State of Georgia and is a cream color.

Quite a number of foundries use this soapstone for their green sand work; also for cores and dry sand work. These foundries are not very particular about the color of their castings, and in many cases are users of their own castings. Soapstone is also purchased by foundries that buy a first class plumbago and are desirous of cheapening it by the addition of a small percentage of this material. I might mention that it is of great assistance to the satisfactory working of plumbago on account of its greasy nature and fire proof qualities.

In conclusion let me say that I have not intended to show that foundrymen do not understand what facings they should use and how they should be used, but as a manufacturer of facings I do claim that too little is known about them for the very important work they have to perform. A great many foundries cannot afford to employ a

chemist but a reliable facing manufacturer will give them facings suited for their work. A great many grades of facings are made for special kinds of work, but I have only selected the principal ones employed in general foundry practice.

The two papers were discussed at length, S. D. Sleeth, E. A. Kebler, H. M. Wilson, B. D. Fuller, S. H. Stupakoff, G. D. Springer and E. G. Seaman taking part in the discussion. It was stated that ground glass has been used successfully in the place of facings and prevents scabbing. A number of foundrymen stated that they would use this glass in an experimental way during the next few weeks and reports of the results will be made at the January meeting.

Papers on "Malleable Cast Iron" by H. E. Diller, of Chicago, and the "Melting Ratio" by A. M. Loudon, of New York, were also read, but were not discussed at length. At the January meeting of the association the topic for discussion will be "Fan Blowers." Lunch was served after the meeting adjourned.

Mechanical Draft Plant for St. Louis Exposition.

The mechanical draft feature of the Union Electric Light & Power Company's plant, which will be used in lighting the World's Fair grounds at St. Louis, will be an installation of unusual interest. The plant is to be equipped with both forced and induced draft apparatus, which is unusual. There will be 26 boilers of 700 h. p. each, and will be equipped with automatic stokers. Fans will be used for the forced draft, and the boilers will also be operated under induced draft. The forced draft fans will be four in number, of the full housing type, size 160 inches. They will be driven by 10x10 vertical engines direct attached. The induced draft fans will be two in number, of a size quite in keeping with the basis upon which the Exposition is being built, the wheel diameters being so large as to be seldom met with in mechanical draft engineering. Each of these induced draft fans will be of the full housing type, size 230 inches and will be driven by 9x10 double cylinder, double acting upright engines, this type being selected to secure the maximum power in limited space. The Buffalo Forge Co. is building all the fans and engines for the above equipment.

Non-Competing Firms Combine.

A company representing a novel form of combination and including concerns manufacturing different products, has been organized at Kansas City, Mo. The capital is $2,500,000 and the companies included are the Hayes Pump & Planter Co., Galva, Ill.; J. L. Clark, carriage manufacturer, Oshkosh, Wis.; Dowagiac Manufacturing Co., Dowagiac, Mich.; F. A. Ames & Co., carriage and vehicle manufacturers, Owensboro, Ky.; Stoughton Wagon Co., Stoughton, Wis., and the South Bend Chilled Plow Co., South Bend, Ind.

Mr. F. A. Ames thus explains the plan of the company: "Our idea is simply to minimize the expenses," "and yet to continue, even increase, our sales. We six manufacturers represent practically everything that goes to supply an agricultural district. There are a pump and planter factory, a carriage factory, a grain drill factory, a general vehicle factory, a wagon factory and a plow factory included in the combination. Now we will operate jointly, but each factory under a separate management. Thus in the one large concern an agricultural district can be supplied. Moreover, that concern, having minimized its expenses, can make reasonable terms for the purchaser."

The Bartlett Bros. Co., Cleveland, recently incorporated to manufacture and deal in heating and ventilating apparatus, succeeds the firm of E. B. and James Bartlett, which had been in business for 10 years. The company's business has rapidly increased in recent years and it now has an engineering department, in which the work of consulting, contracting, and sanitary engineers is carried on.

THE KNOTH OPEN-HEARTH STEEL PROCESS.

A patent on a continuous process of manufacturing open-hearth steel has recently been obtained by Henry Knoth, of Birmingham, Ala. The method is described by the inventor as follows:

"This invention consists in an improved continuous process for manufacturing steel in open-hearth furnaces, having for its object to dispense with the use of scrap metal, which under the previous open-hearth process was charged in large percentages with the pig metal, and also to further facilitate and cheapen the manufacture of open-hearth steel.

"By my process the impurities of the unpurified metal are diluted by mixture with molten refined metal to a point commensurate with the ordinary mixture of pig metal and scrap, after which the further refinement to any desired degree is effected, as usual in the furnace.

"Broadly, my process consists in reserving a predetermined amount of molten refined metal in some receptacle outside of the furnace in which the heat was made and in charging this reserve back into the furnace after it has been cleared and repaired or into any other furnace then ready to be charged, together with the unpurified metal, whether in a molten state or otherwise. By 'unpurified metal' I refer to such metal as would run from a blast furnace, cupola, or other source in a condition requiring further treatment for conversion into steel of the grade to be produced by this process.

"In operation, when the heat in any style of open-hearth furnace is ready to be tapped, I provide a ladle or other receptacle of suitable description to receive the refined metal and convey it to the molds or elsewhere. A predetermined amount of the molten refined metal is reserved in the ladle and after the furnace has been repaired and is ready for another charge is poured back into the furnace in any convenient manner to act as a substitute for steel scrap in diluting the impurities of the unpurified metal which is introduced therewith to complete the charge. I prefer to reserve the molten refined metal in the ladle as the most convenient and practical method of operating my invention; but since the reserving of the metal outside of the furnace in which it was refined is the gist of my invention it is evidently immaterial in what kind of vessel or receptacle or by what means this reserve is effected or how it is introduced into the furnace. This reserve of refined metal may be returned to the furnace and charged therein either before or after the unpurified metal has been introduced, or, as is preferable, the two metals in a molten state may be mixed before charging them into the furnace. In this latter process, which I term the 'mixing process,' the mixed charge as a whole goes into the furnace a mass of molten partly refined metal in which the impurities of the unpurified metal have been diluted by the molten refined metal that has been mixed therewith. The unpurified metal when used in a molten state may be heated in a blast, cupola, or auxiliary heating furnace, from which it can be run to the furnace direct when the refined and unrefined metals are to be charged separately, or from which it can be run into the ladle or other receptacle containing the reserve of molten refined metal, when they are to be charged together.

"I prefer to mix in the ladle, and find that this is most conveniently effected by arranging the heating furnace for the molten unpurified metal opposite or near the molds. The ladle into which the entire contents of the furnace have been tapped is moved to the molds and the desired amount of steel poured therein. As the next step, the ladle, now containing only the reserve of molten refined metal, is moved to the heating furnaces, from which a sufficient amount of molten unpurified metal is poured therein to complete the succeeding charge for the furnace, after which it is run back to the furnace, and its contents, now thoroughly mixed, are charged therein in any convenient manner.

"As the improvement in this latter process consists in combining the two molten metals of different degrees of refinement outside of the furnace and then charging the resultant partly purified mass into the furnace, it is immaterial in what other or different ways this mixing and charging may be effected. The reserving of the molten refined metal from the previous heat makes this a continuous process; but since the reserve is outside of the furnace the bottom may be inspected and repaired between heats, thus obviating the most serious defects in previous continuous processes.

"Though I have referred to the reserve as being introduced back into the furnace from which it was poured, it is obvious that when a number of furnaces are in use the reserve from one may be charged into some other furnace then ready to receive it, and in this manner the continuity of the process is the better preserved."

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in commnnication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

The Virginia Machinery Co., Basic, City, Va., has been chartered, with capital stock of $50,000, and will establish engine and general machinery works. Suitable buildings have been secured; J. A. Patterson, of Waynesboro, Va., president; M. J. Fulton, of Front Royal, Va., vice-president, and T. A. Sammis, of Basic City, secretary.

Rockhill Machine Co., Roanoke, Va., has been incorporated, with capital stock of $10,000; H. B. Rockhill, president, and C. B. Denit, of Salem, Va., secretary.

At Bluefield, W. Va., the Menonah Coal & Coke Co., with a capital stock of $150,000, to mine coal and manufacture coke has been organized. The incorporators are K. E. Harman and O. G. Shaw, of Pulaski City, Va.; O. C. Jenkins, of Bluefield, D. W. Barger, of Shawsville, Va., and A. W. Reynolds, of Princeton, W. Va.

The Elk Machine Shop & Foundry Co., Charleston, W. Va., has been incorporated by Grant P. Hall, John A. Jarrett, S. C. Avis, J. F. Hudson and Ira Mattesheard, to operate machine shop and foundry.

The Vaughan Coal & Coke Co., Welch, W. Va., with a capital stock of $50,000, has been incorporated to mine coal and manufacture coke. The incorporators are J. L. Vaughan, of Roanoke, Va.; E. H. Sudduth, D. L. F. Strouther, S. J. Johnson and James Strothers, of Welch, W. Va.

The Bernhisel Construction Co., of Evanston, Ill., has been incorporated with a capital of $15,000, for erecting bridges and doing general contracting.

The Maxim Co., of Wilmington, Del., has been incorporated with a capital of $12,500 to manufacture and deal in boilers.

The Electric Gate & Signal Co., Omaha, Neb., has been incorporated with a capital stock of $500,000 to establish a plant for the manufacture of electric appliances for railroads. Waldemar Michaelsen, Western Electrical Co., Omaha, George F. Hamilton and others are interested.

The Henry Steel Casting Co. and Henry Truss-Rod Beam Co., each with a capital of $300,000, have been incorporated at St. Louis by A. W. Henry, J. M. Sutherland, Morse B. Schaffer, S. H. West, V. O. Saunders, James Wilson and S. G. Stone.

The Mutual Machine Co., Washington, N. C., is in the market for 10-horse-power horizontal tubular boiler, 10-horse-power vertical or horizontal engine, small jig saw, 20-inch double-head wood-turning lathe, combined punch and shear to punch three-quarters-inch hole in one-half-inch iron and shear ½x2-inch iron, set boilers, rolls five inches, rollers forty-eight inches long, 150-ton hydraulic wheel press to take forty-eight wheels.

A. T. Byrd, Carrsville, Va., wants four to six-horse-power gasoline engine, second-hand in good condition.

E. Barnhill, Franklin, Va., wants four or six-horse-power gasoline engine, second-hand.

The Lennox Machine Co., Marshalltown, Iowa, is in the market for a machine for making ells in its furnace department. The company makes shears, tapping machines and hot air furnaces.

The Panhoist Co., of Marietta, O., has been incorporated with a capital of $10,000 to deal in oil, gas, coal, timber and real estate.

The Colorado Steel Casting Co., has been incorporated, with $500,000 capital, to make railroad castings. The plant will be built in Colorado City and the incorporators are John I. Franklin, C. F. Vanetta, F. J. Hobbs and others.

The Mohawk Valley Steel & Wire Co. has been organized at Portland, Me., with $25,000,000 capital. George A. Reed, of Worcester, Mass., is the promoter of the company which may include several wire plants in the East.

The C. A. Lawton Co., of Depere, Wis., has been organized with $25,000 capital for the purpose of engaging in the foundry business. An iron foundry and machine shop are to be erected shortly. C. A. Lawton, E. W. Lawton and E. B. Lawton are the incorporators.

The Eastern Iron Co., of New York, has been incorporated with $600,000 capital by Charles Andrews, J. M. Clark and C. A. Andrews.

The Worthington Ore Co. has been organized at Birmingham, Ala., with $12,000 capital for the purpose of developing Southern iron ore properties. Thomas Worthington, J. L. Dellou and A. V. Vigo are the incorporators.

The Midland Machinery Co., of Minneapolis, Minn., has been incorporated with $10,000 capital by T. F. Webster, D. Guck and H. G. Bushnell.

The Curtis-Davis Co., of New York, has been incorporated with $50,000 capital to deal in metal goods and supplies. H. A. Curtis, Thomas Davis, Jr., and R. M. Morgan are the incorporators.

The Burns Boiler & Mfg. Co., of Depere, Wis., has been incorporated with $100,000 capital for the purpose of engaging in the manufacture of steam boilers. W. M. Workman, A. B. Burns and D. M. Burns are the incorporators.

The Hollidaysburg Iron & Nail Co., Hollidaysburg, Pa., has increased its capital from $100,000 to $150,000.

A Pennsylvania charter has been granted the Shenango Machine Co., Sharon, Pa., with a capital of $60,000 to operate a foundry and machine shop. F. A. Buhl, Samuel McClure, Joseph Riddell, Michael Kennedy and Daniel Eagan are the incorporators.

The Eastern Pump & Faucet Co., of New York, has been incorporated with $50,000 capital. R. P. Mervin, Richard Collings and A. C. Griscom are the incorporators.

The Preble Machine Works, of Chicago, have been incorporated with $10,000 capital for the purpose of engaging in the manufacture of machinery. J. A. Irrmann, Charles P. Kenning and R. F. Chapin are the incorporators.

The Perry Side Bearing Co., of Joliet, Ill., has been incorporated with $350,000 capital for the purpose of engaging in the manufacture of railway appliances. C. W. Brown, H. H. Stassen and Fred Bennitt are the incorporators.

The Noelke-Richards Iron Works, of Indianapolis, Ind., has been incorporated with $175,000 capital, of which $75,000 is common and the remainder 6 percent cumulative preferred. The incorporators are F. Noelke, C. F. H. Waterman, W. J. Richards, Hugh Richards and James A. McKim. As previously noted in these columns this concern is a consolidation of the Haugh-Noelke Iron Works and the Indiana Ornamental Iron Works.

The Rock Hill Machine Co., of Roanoke, Va., has been incorporated with $10,000 capital to engage in the manufacture of all kinds of machinery. H. B. Rockhill is president; C. D. Denit, secretary and treasurer.

The St. Louis Malleable Casting Co., a subsidiary company of the St. Louis Car Co., has been incorporated with $325,000 capital for the purpose of erecting a large malleable iron foundry. The new plant will cover about five acres. G. J. Kobusch, C. G. Ette, H. C. Duggan, J. W. Baker and H. Luedinghaus are the incorporators.

The Adam Furnace & Supply Co., of Buffalo, N. Y., has been incorporated with $10,000 capital for the purpose of engaging in the manufacture of furnaces, steam fittings and supplies. E. G. Mansfield, W. C. Adam and F. V. Barns are the incorporators.

The National Loom & Wire Co., of Enfield, Conn., has been incorporated with $100,000 capital for the purpose of manufacturing looms, machinery and all kinds of wire products. O. S. Greenleaf, Peter Murray, E. H. Custer and John N. Brown are the incorporators.

The Consolidated Iron & Metal Co., of Denver, Colo., has been incorporated with $50,000 capital. G. G. Morse, B. P. Morse and E. G. Morse are the incorporators.

Fires and Accidents:—

Fire destroyed a large store house of the Union Pacific Railway Co., at Omaha, Nov. 27, and the intense heat rendered useless a large amount of castings stored in the building. The total loss is estimated at $175,000.

As the result of the collapse of the Williamson Iron

Co.'s foundry, at Birmingham, Ala., a few days ago, the general manager, Thomas J. Edwards, was killed. Several workmen were burned, two fatally.

Fire, which started in the foundry of the Michigan Machine Co., Kalamazoo, Mich., caused a loss to stock and building of $1,500; fully insured.

New Construction:

The Grand Rapids Hand Screw Co., Grand Rapids, Mich., will erect a three-story brick factory building at a cost of $7,750.

Joseph F. Rothe, foundryman, of Green Bay, Wis., will erect a large addition to his foundry and will equip it with up to date machinery.

Work on the remodeling and repairing of the B. & O. R. R. shops at Martinsburg, W. Va., was begun a few days ago. Extensive changes will be made to the buildings and a lot of new machinery will be installed.

The D. Clint Prescott Co., Menominee, Mich., has begun the building of an addition, 125x40 feet, to its foundry. The new building will be a story and a half high. Considerable new machinery will be purchased.

The Neches Iron Works, Beaumont, Tex., have begun the construction of larger buildings for their plant. The new structures will be a foundry, 40x90 feet, and pattern shop, 30x80 feet.

The Mobile Railway Terminal Co. has been organized by Samuel Spencer, A. B. Andrews, W. W. Finley, E. L. Russell and others, of the Southern, and proposes to build a modern passenger station at Mobile, Ala., at a cost of about $500,000. Mr. Russell is president of the company.

The Hart Grain Weight Co., Peoria, Ill., has had plans prepared for a new foundry.

The Evansville Tool Co., Evansville, Ind., will build an $8,000 3-story brick factory building, 70x90, having structural and architectural iron, cornices, joist hangers, steam elevator, vaults, wood columns, wall ties, steam heat, gas lighting and slate roofing.

The Satilla Mfg. Co. will erect additional buildings and instal new machinery to improve and increase capacity of its car works at Waycross, Ga.

Work is progressing rapidly on the building at Richland Center, Wis., which will be occupied by Durnford & Craig as a machine shop. The structure will be two stories.

The Belleville Foundry, Belleville, Ill., went into operation a few days ago.

Extensive improvements are being made by the Fergus Iron Works Co., Fergus Falls, Minn.

The Hockensmith Wheel & Mine Car Co. has begun work on its plant four miles from Irwin, Pa. The works will consist of structural steel and brick construction, and the buildings include a foundry and machine shop, 225x60 feet; blacksmith and car erecting shop, 175x50 feet; pattern shop, 125x25 feet, two stories, and power house, 50x50 feet. Electric power is to be used throughout. The approximate cost will be $100,000.

The plans have been made for the machine shop, repair shop and roundhouse for the Baltimore & Ohio at New Castle Junction, Pa. The machine shop will be 200x60 ft. The storehouse and repair shop will be much smaller in dimensions. The roundhouse will have a radius of 190 feet and will house 40 locomotives. Paul Didier will be in charge of the work.

The contract for the blacksmith shops of the new car works of Hochelage, Quebec, for the Canadian Pacific has been let to Lessard & Harris, of Montreal. The building, which is the eighth for which contracts have been let, will be 630 ft. long and 130 ft. wide. There will be an annex for large forges which will serve for both car and locomotive work. Altogether 17 buildings will be put up.

The Excelsior Tool & Machine Works, East St. Louis, Ill., will erect a new foundry and machine shop at a cost of $29,000.

The Lalor Engineering Co., Philadelphia, Pa., will open bids on December 10 for the erection and equipment of the new boiler plant of the Westmoreland Boiler Co., at New Kensington, Pa. The plant will include a foundry 275x50 feet, machine shop 50x80 feet, cleaning department 50x50 feet, boiler house 175x50 feet, storehouse 40x75 feet.

The Evansville Edge Tool Works, Evansville, Ind., will erect a two-story building 75x125 feet. The ground floor will be used as a shipping department and the second floor will be used for the finishing department.

Joseph F. Rothe will erect an iron foundry at Green Bay, Mich., which will be 60x100 feet.

The Allis-Chalmers Co. has plans prepared for the erection of a foundry and machine shop in the northwestern section of Chicago. The machine shop will be four stories high and the foundry one story. The buildings will cover a site 120x360 feet.

Boll Brothers' Mfg. Co., East Harrisburg, Pa., will erect a foundry 240x60 feet.

The Krupp Foundry Co., at Lansdale, Pa., will erect a large modern foundry 100x60 feet. An addition to the machine shop 40x60 feet will also be erected.

The Sligo Iron & Steel Co., of Connellsville, Pa., which has been incorporated with $250,000 capital, has plans under consideration for the erection of a merchant iron rolling mill which will contain 20 puddling furnaces and a bar and guide mill.

The Heath Machine Co., Lestershire, N. Y., is erecting an addition to its machine shop two stories high and 40x100 feet in size.

The Buckeye Malleable Iron Co., Columbus, O., has purchased nine acres of land adjoining its present plant for additions.

Bement, Miles & Co., Philadelphia, will erect an addition to their foundry 51x110 feet.

The Brown Hoisting Machinery Co., of Cleveland, O., has been awarded the contract for the erection of an automatic unloading, conveying, storing and filling plant at the blast furnaces of the Sharon Steel Co., Sharon, Pa. The plant will include a car dumper which picks up a railroad car of 50 tons carrying capacity and dumps the load into a transfer bin, from there to be dropped into two 7½-ton capacity buckets on a transfer car and carried in three buckets over bridges, 300 feet long, to storage bins or a pile, whence the grab buckets take it to the furnace. The plant will include two bridges and will be of capacity to store and feed all the ore required in the three furnaces operated at South Sharon. The mechanism will unload 300 railway cars, or as high as 15,000 tons, in a 10-hour day. The Brown company has already installed a cantilever bridge at the Sharon works.

The Whitlock Coil Pipe Co., of Elmwood, Conn., is building an extensive addition to its plant.

The Ajax Metal Co., of Philadelphia, has more than doubled the capacity of its plant. The new addition is completed and the company is now beginning to install the equipment.

The Pittsburg District:—

Wickes Bros., boiler manufacturers and dealers in second-hand machinery, will erect a boiler plant 50x100 feet adjoining their present warehouse. Considerable property is owned by the company and it is the intention to erect a foundry in the near future.

S. H. Stupakoff, of the Fullman Co., of Pittsburg, and others have organized the Stupakoff Foundry & Machine Co. A site has already been purchased on the Allegheny Valley Railroad and the building on the property will be converted into a small foundry.

The Morton Trust Co. and the Pressed Steel Car Co. have filed a bill in equity in the United States Circuit Court against the Standard Steel Car Co. for an alleged infringement of a patent for bolsters for railway cars.

The Improved Socket & Chuck Co., of Braddock, has been organized to manufacture attachments for machine tools. The company is placing on the market improved drill sockets and chucks. K. O. Muehlberg is president; William Seng, treasurer, and John A. Loew, secretary.

The Diescher Coupling Co., of Pittsburg, has practically completed the special machinery and equipment necessary for the manufacture of all sizes of the Diescher shaft

couplings and will place a complete line on the market about the first of the year.

The new rod mill of the Pittsburg Steel Co., at Monessen, Pa., will be placed in operation this week. The output of this plant will consist of about 500 tons of rods daily.

The Eureka Mfg. Co., composed of Pittsburg and Monongahela City parties has been organized and will erect a large plant at Beaver Falls, Pa. It will consist of a foundry and machine shop.

General Industrial Notes:—

The Norris Scale Co., Madrid, Iowa, has arranged to begin the manufacture of an automatic feeder for steam boilers.

The American Screw Co., of Providence, R. I., has absorbed the Massachusetts Screw Co., of Holyoke, Mass., by purchase outright of its tools, equipment and contracts. The Holyoke plant, which has a capacity of 200,000 gross daily, will be moved to Providence and run in connection with the two large plants which the American Screw Co. has in this city.

The Seneca Chain Co., Kent, O., has voluntarily increased the wages of its employes 10 percent.

Equipment is now being received by J. P. Symons, proprietor of a new foundry at Centralia, Wash. It is expected that the plant will be in operation by the first of the year.

Considerable new equipment has just been put in by the Carthage Foundry & Machine Works, Carthage, Mo.

The Baldwin Locomotive Works, Philadelphia, have shipped ten locomotives to Guatemala for use on a new railway system to be built by American capitalists, connecting the Atlantic and Pacific Oceans. It is said that the new road will bring San Francisco 1500 miles nearer to New York than the Isthmian Canal route. Two hundred cars will be used on the road, and they will be purchased in this country. Several hundred trucks and 6,000 tons of fifty-six pound rails will also be purchased in the United States.

W. J. Brewer Engineering Co., Washington, D. C., will be reorganized, with a capital of $1,000,000, to extend facilities for manufacturing and introducing its patent self-contained roller bearings.

The Hamilton Coal & Coke Co., Newburg, W. Va., has begun development of its 2,300 acres of coal lands. Mines have been opened and 200 tons are being shipped daily; 150 coke ovens have been erected. Irving Adams, of Baltimore, Md., is president; C. Brotemarkle, of Lonaconing, Md., secretary, and W. A. Sommerville, of Frostburg, Md., general manager.

The Detroit Foundry Co., Detroit, Mich., has purchased three and one-half acres of land in Ironville near Detroit and will probably locate its plant on the new site in the near future.

All of the furnaces of the National Steel Co. at New Castle, Pa., have resumed operations after having been banked for nearly ten days on account of the coke shortage.

The Tidewater Steel Co., Chester, Pa., is having a Semet-Solvay by-product oven plant erected which will supply all the coke required by the company. The cost is estimated at $125,000.

The hot mill department of the Gas City, Ind., plant of the American Tin Plate Co., resumed operations last week. The remainder of the plant will probably resume operations in ten days. This plant has been idle for the past four months, owing to the stagnation in the tin plate industry. Six additional mills of the Sharon plant of the American Tin Plate Co. were placed in operation last week, making 16 mills in all in operation by this plant. Four mills continue idle.

The new erecting shop of the McClintic-Marshall Construction Co., at Pottstown, Pa., is fast nearing completion. The building is 180x140 feet in dimensions and is admirably planned for structural fitting work. The 25-ton traveling cranes command the entire plant. The new power house, 50x60 feet, is nearly completed as is the new paint shop, which is 42x20 feet. It is probable that an addition will be built to the present office in the near future.

The American Steel & Wire Co. has leased an immense warehouse, under construction at Salt Lake, Utah. As soon as the building is completed it will be heavily stocked with a full line of wire products and nails.

The American Tube Co., of Somerville, Mass., has purchased a tract of 46 acres at Quincy, Mass. No statement has yet been made regarding the disposition of the property, although it is rumored that the company's plant is to be removed from Somerville.

Officials of the Elliott-Blair Cold Rolled Steel Co., New Castle, Pa., deny that they intend removing their plant to Washington, Pa., and add that they have not negotiated for property in that district.

The Lucas Pump & Mfg. Co., of Toledo, O., has consolidated with the United States Pump & Supply Co., of the same place. The latter concern is a consolidation of the Standard Mfg. Co., of Toledo, O., and the Bean-Chamberlain Pump Co., of Hudson, Mich.

The plant of the Medina Foundry Co., of Medina, O., has been sold to McGuire & McGuire, of Cleveland, O. A specialty will be made of stoves, although a part of the plant will operate on general castings.

The American Screw Co., of Providence, R. I., has purchased the plant of the Massachusetts Screw Co., at Holyoke, Mass. This plant will be removed to Providence and will be operated in connection with the two plants of the American Screw Co., at that place.

The Warren Sheet Metal Co., Warren, O., has been organized as follows: W. C. Winfield, president; C. O. Hart, vice president; C. B. Selby, secretary and treasurer and C. A. Crane, general manager. The officers together with William Wallace comprise the board of directors. Work on the erection of the company's new plant will commence shortly.

Contracts were awarded last week for the erection of the first building of the plant of the Standard Motive Power Co., at Canal Dover, O. Contracts for a large amount of machinery have also been let. The plans as adopted provide for the erection of fifteen buildings. The cost of the plant is estimated at $2,000,000. The Dodge type of locomotive will be built.

The National Machinery Co., of Tiffin, O., reports that business in the bolt, nut and special machinery trade in the last thirty days has been exceptionably good. Judging from orders on hand and inquiries received, and considering the fact that this is the dull season of the year, the company looks for a large volume of business for the first of the year. Rumors of decreasing trade are not substantiated in this instance and the company's plant is running to its full capacity to take care of what promises to be the largest year in its history. Foreign trade is picking up, and substantial orders have been received from France and Germany.

The new foundry of the American Ship Building Co., at Detroit, will be equipped with 72-inch and 42-inch Newten patent cupolas, made by Northern Engineering Works, Detroit. The new buildings are nearly under roof and when completed, the plant will be a model one for heavy casting work.

The Franklin furnace at Clinton, N. Y., has been blown in after being out of blast for two months. Extensive improvements have been made. A new dynamo has been put in, which will furnish all the lights in and about the plant. All of the tenement houses have been newly painted and put in first class condition for the employes. The engine house has also been altered and improvements made. There is on hand now an abundant supply of coke, coal, limestone and ore, and it is thought no further trouble will arise from a shortage.

The Round Mountain Furnace, at Round Mountain, Ga., which has long been idle has undergone extensive repairs and was put in blast November 29. It is a charcoal furnace making strictly cold blast iron, the product being used by makers of rolls particularly. The make amounts to 15 to 20 tons per day. Rogers, Brown & Co. are sales agents.

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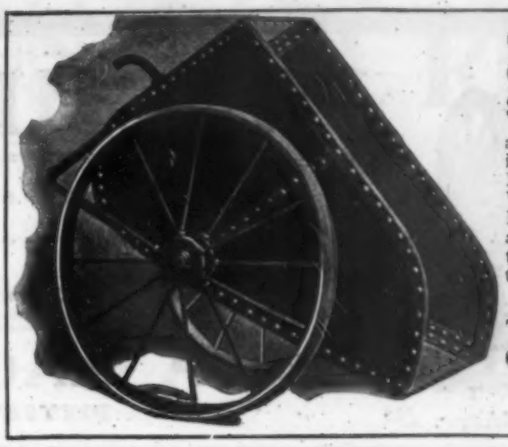

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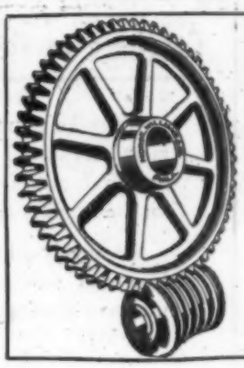

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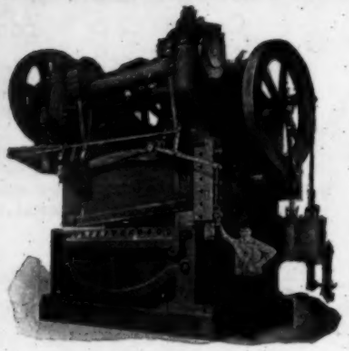

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